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**SOUTH CAROLINA ELECTRIC & GAS COMPANY**

**COLUMBIA, SC 29218**

**EXHIBIT A**

**TRANSMISSION LINE ENVIRONMENTAL ASSESSMENT REPORT**

**FOR THE PROPOSED**

**HOPKINS 230KV FOLD-IN**

**AND**

**HOPKINS 230 - 115KV TRANSMISSION SUBSTATION**

**RICHLAND COUNTY, S C**

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*September 2004*

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## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>EXECUTIVE SUMMARY</b>                                     | <b>1</b>  |
| The Proposed Action  | 1         |
| Alternative Solutions in Addition to the Proposed Action     | 1         |
| Estimated Project Cost                                       | 2         |
| Transmission Line Route Selection                            | 2         |
| The Affected Environment                                     | 3         |
| Environmental Consequences of the Proposed Action            | 4         |
| <br>   |           |
| <b>1.0 INTRODUCTION</b>                                      | <b>7</b>  |
| <br>   |           |
| <b>2.0 FACILITY DESCRIPTION AND ESTIMATED PROJECT COST</b>   | <b>8</b>  |
| Facility Description   | 8         |
| Estimated Project Cost                                       | 8         |
| <br>   |           |
| <b>3.0 ALTERNATIVES TO THE PROPOSED ACTION</b>               | <b>9</b>  |
| 3.1 Alternative Solutions in Addition to the Proposed Action | 9         |
| 3.2 Alternative Transmission Line Routes                     | 10        |
| <br>   |           |
| <b>4.0 THE AFFECTED ENVIRONMENT</b>                          | <b>12</b> |
| 4.1 Land Use   | 12        |
| 4.2 Topography   | 12        |
| 4.3 Geology and Soils  | 13        |
| 4.4 Surface Water Hydrology                                  | 13        |
| 4.5 Land Cover   | 14        |
| 4.6 Wildlife   | 16        |
| 4.7 Fisheries  | 17        |
| 4.8 Rare, Threatened, and Endangered Resources               | 17        |
| 4.9 Cultural Resources                                       | 20        |
| 4.10 Visual Resources  | 20        |

|            |   |           |
|------------|---|-----------|
| <b>5.0</b> | <b>ENVIRONMENTAL CONSEQUENCES ASSOCIATED WITH THE<br/>PROPOSED ACTION</b> | <b>22</b> |
| 5.1        | Soils   | 22        |
| 5.2        | Water Resources   | 22        |
| 5.3        | Flood-Prone Areas   | 23        |
| 5.4        | Land Use  | 24        |
| 5.5        | Prime Farmlands   | 24        |
| 5.6        | Wetlands  | 25        |
| 5.7        | Rare, Threatened, and Endangered Resources                                | 26        |
| 5.8        | Cultural Resources  | 27        |
| 5.9        | Visual Resources  | 27        |
| 5.10       | Aviation  | 28        |
| 5.11       | Noise, Radio, and Television Interference                                 | 28        |
| 5.12       | Safety  | 29        |
| 5.13       | Electric and Magnetic Fields  | 29        |
| 5.14       | Ozone   | 30        |

## **FIGURES**

|          |   |
|----------|---|
| Figure 1 | Project Location Map                          |
| Figure 2 | Typical Cross Section — Hopkins 230kV Fold-In |
| Figure 3 | Aerial Photography with Property Lines        |
| Figure 4 | Land Use                                      |
| Figure 5 | Land Cover                                    |
| Figure 6 | Hydrography/Wetlands                          |
| Figure 7 | FEMA Flood Zones                              |
| Figure 8 | USGS 7.5 Minute Quadrangle Mapping            |

## **APPENDICES**

|            |  |
|------------|--|
| APPENDIX A | Data Sources, Agencies Consulted, and References   |
| APPENDIX B | Biological Survey Report   |
| APPENDIX C | Cultural Resources Survey Report   |
| APPENDIX D | SC Rare, Threatened, And Endangered Species Inventory For Richland<br>County, South Carolina |

## EXECUTIVE SUMMARY

### The Proposed Action

South Carolina Electric and Gas Company ("SCE&G") proposes to build a new 230kV fold-in that will connect its proposed Hopkins 230kV Transmission Substation ("Transmission Substation") to its existing Wateree-Columbia Energy 230kV Line in southern Richland County, SC (*Figure 1*). The fold-in will consist of two single-circuit 230kV lines that will be constructed 10' apart and parallel to each other on a new 100'-wide right-of-way (*Figure 2*). The proposed fold-in will be approximately 1.32-miles long and will be known as the Hopkins 230kV Fold-In Line Section ("Hopkins Fold-In", "230kV Fold-In", or "Fold-In"). From the existing Wateree-Columbia Energy 230kV Line, the Hopkins Fold-In will run in a northern direction and parallel to SCE&G's existing Westinghouse 115kV Line for approximately 0.64-miles where it will turn and run approximately 0.68-miles to the future Hopkins Transmission Substation. The Fold-In will be built on right-of-way that will be acquired from three property owners, including Westinghouse Electric Company, LLC from whom SCE&G purchased the 6.89-acre Hopkins Transmission Substation site (*Figure 3*).

### Alternative Solutions in Addition to the Proposed Action

SCE&G's transmission system analyses indicate that a new 230-115kV Transmission Substation must be added on its transmission system to support load growth in the Southeastern Columbia/Lower Richland regions of the SCE&G service area. Generally, the area to be supported by the proposed Hopkins Transmission Substation is bounded by the Congaree River, Fort Jackson, and the edge of the SCE&G service territory near Eastover, SC. SCE&G's 115kV transmission grid is the primary transmission delivery voltage to the SCE&G distribution voltage system throughout the region, and the 115kV system that now serves the Southeastern Columbia/Lower Richland region is served from SCE&G's Columbia Industrial Park 230-115 kV Transmission Substation located on Bluff Road. In the past, following any event in the Columbia Industrial Park Transmission Substation that caused the substation to become unavailable, two existing 115kV lines that extend into the region---one from the West Columbia area and the second from the Saluda Hydro/McMeekin Generating complex located at Lake Murray----provided emergency, backup service. These two lines have reached their capacity and can no longer provide backup service for the existing electrical load in the region. The addition of the Hopkins 230kV Fold-In and 230-115kV Transmission Substation are needed

to maintain electrical service reliability and voltage support in the Southeastern Columbia/Lower Richland region.

SCE&G considered two alternatives to the proposed action and determined that either of them would only provide short-term solutions and would cost more than the proposed Hopkins 230kV Fold-In and Hopkins 230-115kV Transmission Substation; therefore, SCE&G has determined that there is no practical, effective, economical alternative to the proposed action.

### **Estimated Project Cost**

SCE&G estimates that the total cost for the Hopkins 230kV Fold-In and associated 230kV Substation will be approximately \$4,830,000 as shown below:

|   |                     |
|---|---------------------|
| Hopkins 230-115kV Substation                  | \$ 4,000,000        |
| Hopkins Substation Lot and 230kV Right-Of-Way | \$ 230,000          |
| <u>Hopkins 230kV Fold-In</u>                  | <u>\$ 600,000</u>   |
| <b>Total Estimated Cost</b>                   | <b>\$ 4,830,000</b> |

### **Transmission Line Route Selection**

SCE&G conducted a line siting study to determine the most practical route for the Hopkins Fold-In Line. A siting study area was delineated that included the entire geographic area through which any practical route connecting the Wateree-Columbia Energy 230kV Line and the site purchased for the Hopkins Transmission Substation would pass. Data was collected to characterize the study area and to identify any environmental, land use, or cultural resource factors that should be taken into consideration during the siting study. After mapping the array of data, SCE&G determined that routing the proposed Hopkins 230kV Fold-In parallel to its existing Westinghouse 115kV Line for 0.64-miles (approximately one-half of its total length) will be superior to any alternate route for the following reasons:

1. Running parallel to the existing 115kV line minimizes the overall length of the Hopkins Fold-In, which will be 1.32-miles in length;

to maintain electrical service reliability and voltage support in the Southeastern Columbia/Lower Richland region.

SCE&G considered two alternatives to the proposed action and determined that either of them would only provide short-term solutions and would cost more than the proposed Hopkins 230kV Fold-In and Hopkins 230-115kV Transmission Substation; therefore, SCE&G has determined that there is no practical, effective, economical alternative to the proposed action.

### **Estimated Project Cost**

SCE&G estimates that the total project cost will be \$8,650,000 as shown in the following table:

| <b>Description of Cost</b>  | <b>Estimated Cost</b> |
|---|-----------------------|
|   |                       |
| Hopkins 230-115kV Transmission Substation (including the station lot) | \$ 6,500,000          |
| Hopkins 230kV Fold-In (including right-of-way cost)                   | \$ 2,150,000          |
| <b>Total Estimated Cost</b>   | <b>\$ 8,650,000</b>   |

### **Transmission Line Route Selection**

SCE&G conducted a line siting study to determine the most practical route for the Hopkins Fold-In Line. A siting study area was delineated that included the entire geographic area through which any practical route connecting the Wateree-Columbia Energy 230kV Line and the site purchased for the Hopkins Transmission Substation would pass. Data was collected to characterize the study study area and to identify any environmental, land use, or cultural resource factors that should be taken into consideration during the siting study. After mapping the array of data, SCE&G determined that routing the proposed Hopkins 230kV Fold-In parallel to its existing Westinghouse 115kV Line for 0.64-miles (approximately one-half of its total length) will be superior to any alternate route for the following reasons:

1. Running parallel to the existing 115kV line minimizes the overall length of the Hopkins Fold-In, which will be 1.32-miles in length;

2. Following the route of the existing line allows the use of existing roads to access the new right-of-way;
3. The route parallel to the Westinghouse 115kV Line optimizes the crossing of a forested wetland between the Wateree-Columbia Energy 230kV Line and the site purchased for the Hopkins Transmission Substation (e.g., no structures will be required in the wetland);
4. Affects to land use and future land use are minimized by widening an existing transmission line corridor compared to the introduction of a second, separate corridor nearby; and,
5. Careful analysis of the data collected and mapped in the siting study, which included intensive biological and cultural resource surveys, confirms a route parallel to the existing Westinghouse 115kV Line for approximately 0.64-miles of the total 1.32-mile length does not affect rare, threatened or endangered species or cultural resources.

At a point approximately 0.64-miles from the Wateree-Columbia Energy 230kV Line, the selected route for the Hopkins Fold-In turns approximately 15-degrees and departs from the existing 115kV line. The departure from the parallel run with the existing line is necessary to avoid placing the Hopkins Fold-In over an unmaintained cemetery on the Westinghouse Electric Company, LLC property. Turning the line will avoid the cemetery and allow the line to follow a direct route to a location on the western side of the Hopkins Transmission Substation site where it will terminate on the station's high-side electrical bus.

### **The Affected Environment**

A mix of pine plantations, swamp forest, agricultural fields, old fields, and the Westinghouse Electric Company, LLC industrial complex characterize the immediate area through which the Hopkins 230kV Fold-In will pass. Wetland areas are extensive in the region and in the immediate vicinity of the proposed line include forested, scrub/shrub, and emergent wetland types. The proposed line route crosses an agricultural field near the future Hopkins 230-115kV substation that is used for small grain production. There are no commercial, residential, or institutional land uses within ½-mile of the proposed Hopkins Fold-In or the Hopkins 230-115kV Transmission Substation. No city, county, or federal parks or recreational areas are located within 2-miles of the future Fold-In and Hopkins Transmission Substation. The closest federal park, the Congaree Swamp National Monument, is located approximately 6.5-miles southeast of the proposed Hopkins Fold-In and Transmission Substation.



## **Environmental Consequences of the Proposed Action**

The proposed Hopkins 230kV Fold-In will have minimal short- and long-term effects on the environment. Because construction of the proposed Hopkins 230kV Fold-In will be accomplished by placing 0.64-miles of its total 1.32-mile length on a new 100'-wide right-of-way parallel to an existing SCE&G 100'-wide right-of-way, effects to environmental resources, cultural resources, land use, and aesthetics will be minimized. The most significant environmental effect associated with construction of the new line will be the conversion of forested wetlands, approximately 2.18-acres, to shrub/scrub wetlands for the life of the line. Although SCE&G will not clear and grub the new 100'-wide right-of-way, soil disturbance will occur at structure sites and along access roads. The erosion-control measures employed will be sufficient to prevent any sediment movement beyond sediment control devices and construction limits during a 25-year storm event.

### **Rare, Threatened, and Endangered Species**

A field inventory of the proposed substation site and a 300-foot wide Hopkins Fold-In study corridor (the proposed 100'-wide right-of-way and 100' on each side) was conducted on April 13, 2004 and no rare, threatened or endangered species that could potentially exist in Richland County, SC according to the records of the South Carolina Heritage Trust Program ("SCHTP") and the United States Fish and Wildlife Service ("USFWS") were found (*Appendix D*).

### **Cultural Resources**

The South Carolina Archives & History Center ("SCAHC") and the South Carolina Institute of Archaeology and Anthropology ("SCIAA") were contacted regarding cultural resources in the siting study area. The SCAHC database revealed nine previously recorded cultural resources in the general vicinity of the Hopkins 230-115kV Transmission Substation and 230kV Fold-In. Seven of the sites are listed as "artifact scatter", one as "Thomas Howell Plantation c. 1740", and one as "excavated canal-historic". Only one site, the canal, will be directly affected by the project since it will be spanned by the proposed Hopkins 230kV Fold-In. It will be crossed by the proposed Hopkins 230kV Fold-In and is listed in the SCAHC database as potentially eligible for the NRHP, but according to an investigation along the future line's route by Archaeological Consultants of the Carolinas on April 13, 2004, it does not meet eligibility criteria. The results of the investigation conducted by Archaeological Consultants of

the Carolinas, LLC ("ACC") was contained in a report entitled Archaeological Survey of the Hopkins Transmission Line and Substation, Richland County-Final Report and forwarded to the SC Archives and History Center. In a letter dated April 24, 2004 the SC Archives and History Center notified SCE&G that no further cultural resource investigations are recommended and that the project will not likely affect cultural resources (*Appendix C*).

### **Water Resources**

Construction of the Hopkins 230kV Fold-In could possibly potentially cause soil erosion and sediment-runoff contributions to nearby streams and wetlands; however, SCE&G will minimize any potential sedimentation impact through the use of prudent design, construction, and erosion control measures. The erosion control measures and Best Management Practices ("BMP's") employed will be sufficient to prevent any sediment movement beyond construction limits during a 25-year storm event.

### **Flood-Prone Areas**

The Federal Emergency Management Agency National Flood Insurance Program maps for Richland County document 100 and 500-year flood zones associated with Mill Creek and the Congaree River (*Figure 7*). Generally, the proposed Transmission Substation site and the northern portion of the future line route are located in the 500-year flood zone, and the southern portion of the line route is located in the 100-year flood zone.

### **Wetlands**

It was determined during the biological field survey that the proposed Hopkins 230kV Fold-In will cross four wetlands. The National Wetlands Inventory (NWI) database, which is based primarily on aerial photography, indicates potential forested wetlands at three locations and a scrub/shrub wetland along the study corridor (300-feet wide) for the proposed Hopkins 230kV Line. Two are small wetland inclusions in a bottomland forest. One is a forested wetland along a man-made canal that is approximately 300' in length along the future line's right-of-way. The fourth wetland is a forested wetland along Mill Creek and is approximately 600' in length (*Appendix B*). Each of the wetlands occur on the southern segment of the proposed Fold-In route and no wetlands are located on the Transmission Substation site or the northern segment of the Fold-In route.

**Visual Resources**

SCE&G carefully considers the visual effects of the proposed transmission line. Because the proposed Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will be located in a remote area on private property, neither will be visible from public roads or residences.

**Public Safety**

To ensure public safety and system reliability, SCE&G will design and construct the proposed Transmission Substation and Fold-In line in such a way that they will comply with, or exceed, the National Electrical Safety Code in effect at the time of construction. Further, SCE&G commits to continue its long-standing tradition of operating and maintaining its facilities in a manner that will ensure public safety over the life of these facilities.

## **1.0 INTRODUCTION**

SCE&G, based in Columbia, South Carolina, is a wholly owned subsidiary of SCANA Corporation, an energy-based holding company. SCE&G serves over 500,000 electric customers in central and southern South Carolina.

To provide electrical capacity to meet demand in the Southeastern Columbia/Lower Richland region of its service area, SCE&G is proposing to build a new 230-115kV Transmission Substation and 1.32-mile 230kV fold-in in Richland County, SC, near the Westinghouse Electric Company, LLC industrial complex on Bluff Road. The station will be known as the Hopkins 230-115kV Transmission Substation and the fold-in will be known as the Hopkins 230kV Fold-In Line Section ("Hopkins Fold-In", "230kV Fold-In", or "Fold-In"). The project is located approximately 10 miles southeast of Columbia and 8.5 miles southeast of the intersection of Interstate-77 and SC Highway 48. The closest town is Hopkins, SC, which is 2.5 miles northeast of the future Hopkins Transmission Substation site.

## 2.0 FACILITY DESCRIPTION and ESTIMATED PROJECT COST

### Facility Description

South Carolina Electric and Gas Company ("SCE&G") proposes to build a new 230kV "fold-in" ("Hopkins Fold-In, 230kV Fold-In, or Fold-In") that will connect its proposed Hopkins 230kV Transmission Substation to its existing Wateree-Columbia Energy 230kV Line in southern Richland County, SC (*Figure 1*). The Fold-In will consist of two single-circuit 230kV lines that will be constructed 10' apart and parallel to each other on a new 100'-wide right-of-way (*Figure 2*). Line structures will be steel or concrete poles that are typically spaced between 600 and 800' apart depending on topographical conditions. The height range of the poles is typically between 85 and 105'.

The proposed Fold-In will be approximately 1.32-miles long and will be known as the Hopkins 230kV Fold-In Section. From the existing Wateree-Columbia Energy 230kV Line, the Hopkins Fold-In will run in a northern direction and parallel to SCE&G's existing Westinghouse 115kV Line for approximately 0.64-miles where it will turn and run approximately 0.68-miles to the future Hopkins Transmission Substation. The Fold-In will be built on right-of-way that will be acquired from three property owners, including Westinghouse Electric Company, LLC from whom SCE&G purchased the 6.89-acre Hopkins Transmission Substation site (*Figure 3*).

The Hopkins 230-115kV Substation will include one 230/115kV-336 MVA transformer, two 230kV transmission line terminals, three 115kV transmission line terminals, and one 115kV bus-tie breaker. The substation site will be graded to level a substation yard that will be gravel paved and enclosed within a 7'-high chain-link fence that will be topped with 3-strands of barbed wire. The area inside the station security fence will be 4.85-acres.

### Estimated Project Cost

SCE&G estimates that the total cost for the Hopkins 230kV Fold-In and associated 230kV Substation will be approximately \$4,830,000 as shown below:

|   |                     |
|---|---------------------|
| Hopkins 230-115kV Substation                  | \$ 4,000,000        |
| Hopkins Substation Lot and 230kV Right-Of-Way | \$ 230,000          |
| <u>Hopkins 230kV Fold-In</u>                  | <u>\$ 600,000</u>   |
| <b>Total Estimated Cost</b>                   | <b>\$ 4,830,000</b> |

### **3.0 ALTERNATIVES TO THE PROPOSED ACTION**

#### **3.1 Alternative Solutions in Addition to the Proposed Action**

SCE&G's transmission system analyses indicate that a new 230-115kV Transmission Substation must be added on its transmission system to support load growth in the Southeastern Columbia/Lower Richland region of the SCE&G service area. Generally, the area to be supported by the proposed Hopkins Transmission Substation is bounded by the Congaree River, Fort Jackson, and the edge of the SCE&G service territory near Eastover, SC. SCE&G's 115kV transmission grid is the primary transmission delivery voltage to the SCE&G distribution voltage system throughout the region, and the 115kV system that now serves the Southeastern Columbia/Lower Richland region is served from SCE&G's Columbia Industrial Park 230-115 kV Transmission Substation located on Bluff Road. In the past, following any event in the Columbia Industrial Park Transmission Substation that caused the substation to become unavailable, two existing 115kV lines that extend into the region---one from the West Columbia area and the second from the Saluda Hydro/McMeekin Generating complex located at Lake Murray---provided emergency, backup service. These two lines have reached their capacity and can no longer provide backup service for the existing electrical load in the region. The addition of the Hopkins 230kV Transmission Substation and 230kV Fold-In are needed to maintain electrical service reliability and voltage support in the Southeastern Columbia/Lower Richland region.

SCE&G transmission system planners considered several alternatives to provide the needed improvements. One alternative considered was to increase the capability of the two 115kV transmission lines that have been providing emergency, backup service to the Southeastern Columbia/Lower Richland region by increasing their electrical capacity. The results of this study indicated that rebuilding the two lines would be significantly more expensive than the proposed action and would be only a short-term solution. Even if the two lines were upgraded, the studies indicate that as customer electrical demand in the Southeastern Columbia/Lower Richland region continues to grow, delivery voltages will decline to unacceptable levels.

A second alternative considered was to install a second 230/115kV transformer in the existing Columbia Industrial Park 230-115kV Transmission Substation and upgrade the 115kV transmission network in the region to provide the ability to deliver more electrical capacity to the

Southeastern Columbia/Lower Richland region. The study concluded that this alternative is also more expensive than the proposed action and would only provide a short-term solution. Installing a second transformer in the Columbia Industrial Park 230-115kV Transmission Substation creates a very heavy dependency on the substation. In the event the substation is taken out of service due to storms, equipment failure, or other reasons, there would be no backup source of electrical energy in the region to serve SCE&G's customers.

Because both of the alternatives to the proposed action are short-term solutions, additional transmission improvements and costs would be required in the near future. SCE&G, therefore, has concluded that there is no practical, economical alternative to adding capacity on the SCE&G 115kV system in the Southeastern Columbia/Lower Richland except through the addition of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In.

### **3.2 Alternative Transmission Line Routes**

SCE&G conducted a line siting study to determine the most practical route for the Hopkins Fold-In Line. A siting study area was delineated that included the entire geographic area through which any practical route connecting the Wateree-Columbia Energy 230kV Line and the site purchased for the Hopkins Transmission Substation would pass. Data was collected to characterize the siting study area and to identify any environmental, land use, or cultural resource factors that should be taken into consideration during the siting study. After mapping the array of data, SCE&G determined that routing the proposed Hopkins 230kV Fold-In parallel to its existing Westinghouse 115kV Line for 0.64-miles (approximately one-half of its total length) will be superior to any alternate route for the following reasons:

1. Running parallel to the existing 115kV line minimizes the overall length of the Hopkins Fold-In, which will be 1.32-miles in length;
2. Following the route of the existing line allows the use of existing roads to access the new right-of-way;
3. The route parallel to the Westinghouse 115kV Line optimizes the crossing of a forested wetland between the Wateree-Columbia Energy 230kV Line and the site purchased for the Hopkins Transmission Substation (e.g., no structures will be required in the wetland);

4. Affects to land use and future land use are minimized by widening an existing transmission line corridor compared to the introduction of a second, separate corridor nearby; and,
5. Careful analysis of the data collected and mapped in the siting study, which included intensive biological and cultural resource surveys, confirms a route parallel to the existing Westinghouse 115kV Line for approximately 0.64-miles of the total 1.32-mile length does not affect rare, threatened or endangered species or cultural resources.

At a point approximately 0.64-miles from the Wateree-Columbia Energy 230kV Line, the selected route for the Hopkins Fold-In turns approximately 15-degrees and departs from the existing 115kV line. The departure from the parallel run with the existing line is necessary to avoid placing the Hopkins Fold-In over an unmaintained cemetery on the Westinghouse Electric Company, LLC property. Turning the line will avoid the cemetery and allow the line to follow a direct route to a location on the western side of the Hopkins Transmission Substation site where it will terminate on the station's high-side electrical bus.



## **4.0 THE AFFECTED ENVIRONMENT**

Information on the affected environment was compiled from a literature review, interpreting aerial photography, information received from resource agencies, and extensive field studies along the route of the proposed Hopkins 230kV Fold-In and on the site of the future Hopkins 230-115kV Transmission Substation. This process provided a quantitative and qualitative description of the existing environment, which was used when predicting the environmental effects that will result from the proposed line and substation's construction.

### **4.1 Land Use**

The project is located in Richland County, SC, 10 miles southeast of Columbia and 8.5 miles southeast of the intersection of Interstate-77 and SC Highway 48. The closest town is Hopkins, SC, which is 2.5 miles to the northeast of the future Hopkins Transmission Substation and 230kV Fold-In. The project is located in a remote rural area, primarily on property owned by Westinghouse Electric Company, LLC. Except for the Westinghouse Electric Company, LLC industrial complex, land use in the general vicinity is predominantly pine plantations, forested swamps associated with the Congaree River floodplain, and agricultural fields. Several canals and ditches occur in the area that allow for crop production on the low-lying lands (*Figures 3, 4, 5, and 6*).

No city, county, or federal parks or recreational areas are located within 2-miles of the future Fold-In and Hopkins Transmission Substation. The closest federal park, the Congaree Swamp National Monument, is located approximately 6.5-miles southeast of the proposed Hopkins Fold-In and Transmission Substation.

### **4.2 Topography**

The Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will be located in the Coastal Plain Province of South Carolina. The area is characterized by generally low, flat topography with meandering streams, swamp forests, and manmade canals that drain to the Congaree River floodplain. Ground elevations range from 100 feet to 145 feet above mean sea level ("MSL") in the immediate vicinity of the proposed Fold-In and Transmission Substation (*Figure 8*).

### **4.3 Geology and Soils**

The project is in the Atlantic Coastal Plain physiographic province. The underlying geology of the area is primarily unconsolidated marine deposits of light colored sands and kaolin clays. Soils are typically characterized by silty and clayey alluvial sediments that have washed in from the Piedmont Province (USDA 1978). The soils are naturally low in fertility.

The predominant soil associations in the siting study area are the Persanti-Cantey-Goldsboro and the Congaree-Tawcaw-Chastain. The Persanti-Cantey-Goldsboro association is present on the Transmission Substation site and the northern portion of the line; the Congaree-Tawcaw-Chastain association is located in the area surrounding the southern segment of the proposed Fold-In line. Persanti is the dominant soil type in the northern portion of the siting study area, and it is a clayey, kaolinitic soil. The Congaree soil type dominates the southern portion of the siting study area, and it is a fine sandy-loam soil (USDA 1978). The soils of the southern portion of the siting study area are subject to frequent flooding for both short and long durations, but the northern portion is not. In both the southern and northern portions of the siting study area, the water table is generally high and bedrock is greater than 60 inches deep. The erodibility of the soils (K) ranges from 0.28 on the southern portion of the siting study area to 0.43 on the northern portion (higher values of K indicate a higher potential for erosion). Even though the soils along the northern segment of the proposed Hopkins 230kV Fold-In are moderately erosive, the slope of the terrain averages less than 5% (range 0-15%) in the Congaree drainage (SCDHEC 2004), thus substantially reducing the potential for land disturbing activities to cause off-site sedimentation.

Soils classified as Prime Farmland soils by the US Department of Agriculture-Natural Resources Conservation Service ("NRCS") are found in the siting study area. However, according to the NRCS, Prime Farmland does not include land already in or committed to urban development or water storage. The soils in the siting study area that are soils of the Prime Farmland designation include Congaree (State wide importance), Goldsboro, and Persanti. All of these soils have slopes less than 15 percent.

### **4.4 Surface Water Hydrology**

The basic source of water resources in the siting study area is precipitation, which averages approximately 47 inches annually. About 57 percent of the annual rainfall occurs from

April through September (USDA 1978). On average, 54 thunderstorms occur each year, and about 32 of these occur during the summer.

The Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will be located in the Congaree River drainage that joins the Wateree River before flowing into Lake Marion. Waters from Lake Marion flow into the Santee River and also, via a diversion canal, into Lake Moultrie and then to the Cooper River. Both the Santee and Cooper Rivers have outlets to the Atlantic Ocean. The only stream in the vicinity of the project is Mill Creek with its many meanders and drainage canals (*Figure 6*). The South Carolina Department of Health and Environmental Control (2004) reports that Mill Creek and associated wetlands and tributaries are affected by groundwater contamination from various spills and leaks at the Westinghouse Electric Company, LLC industrial complex and that a groundwater remediation program is underway. Mill Creek water quality monitoring data suggest that the creek is fully supporting aquatic life, but is only partially supporting recreation uses because of fecal coliform bacteria excursions at one of two monitoring sites (SCDHEC 2004).

Through review of the National Wetland Inventory maps, SCE&G determined that wetlands in the vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In are generally associated with Mill Creek (*Figure 6*). Forested wetlands are the predominant wetland type found, although there are man-made drainage canals that exhibit wetland characteristics, and some scrub/shrub wetlands associated with cultivated fields in the area.

The Federal Emergency Management Agency National Flood Insurance Program maps for Richland County document 100 and 500-year flood zones associated with Mill Creek and the Congaree River (*Figure 7*). Generally, the proposed Transmission Substation site and the northern portion of the future line route are located in the 500-year flood zone, and the southern portion of the line route is located in the 100-year flood zone.

#### **4.5 Land Cover**

An inventory of land cover in the siting study area was made through analysis and classification of aerial photography and field investigations (*Figure 5*). Most of the region in the vicinity of the siting study area is rural, consisting of pine plantations, swamp forest, agricultural fields, old fields, and the Westinghouse Electric Company, LLC industrial complex. No residences are located within one-half mile of the future Transmission Substation or Fold-In line.

SC Department of Health and Environmental Control (2004) estimates land cover/land use in the Congaree watershed as 9.45% urban land, 7.24% agricultural land, 2.22% scrub/shrub land, 0.09% barren land, 61.76% forested land, 16.45% forested wetland, and 2.79% water.

Two natural vegetative communities are found in the siting study area. These communities are the Bald Cypress-tupelo gum swamp and the Bottomland Hardwood Forest (Nelson 1986). Managed vegetation communities also occur and include pine plantations, agricultural fields, rights-of-way, and early succession fields.

A common natural community found in the immediate vicinity of the siting study area is the Bald Cypress-tupelo gum swamp Forest (Nelson 1986). This community occurs in and adjacent to Mill Creek. In the siting study area, bald cypress was absent from this community, and tupelo gum (*Nyssa aquatica*) was a dominant species along with red maple (*Acer rubrum*) and ash (*Fraxinus* spp.). This community was inundated with water and contained few herbaceous species. Sweet-gum (*Liquidambar styraciflua*), cherrybark oak (*Quercus falcata* var. *pagodaefolia*), swamp chestnut oak (*Q. michauxii*), and American elm (*Ulmus americana*) commonly bordered the swamp forest. Common shrubs include Virginia willow (*Itea virginica*) and poison sumac (*Toxicodendron vernix*); swamp forest borders contained privet (*Ligustrum sinense*), ironwood (*Carpinus caroliniana*), and deciduous holly (*Ilex decidua*). Herbaceous vegetation included lizard's tail (*Saururus cernuus*), duckweed (*Lemna* spp.), duck-potato (*Sagittaria* spp.), ragwort (*Senecio glabellus*), and jack-in-the-pulpit (*Arisaema triphyllum*).

Bottomland forests are also found in association with the swamp forests, and in some cases were the result of past ditching of the swamp forests. Primary trees in this community are cherrybark oak, swamp chestnut oak, sweet-gum, red maple, willow oak (*Q. phellos*), water oak (*Q. nigra*), American elm, and hackberry (*Celtis laevigata*). Understory trees and shrubs are box elder (*Acer negundo*), ironwood, pawpaw (*Asimina triloba*), American holly (*Ilex opaca*), elderberry (*Sambucus canadensis*), and deciduous holly. The bottomland hardwoods have an abundance of woody vines including crossvine (*Bignonia capreolata*), Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax roundifolia*), poison ivy (*Toxicodendron radicans*), honeysuckle (*Lonicera japonica*), and trumpet vine (*Campsis radicans*). Common herbs were sedges (*Carex* spp.), green dragon (*Arisaema dracontium*), yellow harlequin (*Corydalis flavula*), Atamasco lily (*Zephyranthes atamasco*), and cane (*Arundinaria gigantea*).

Several managed plant communities exist throughout the siting study area. The most common is the pine plantation, which was planted with loblolly pines (*Pinus taeda*); these plantations were less than ten years old and contained little vegetation except pines, except for minor populations of sweet-gum, red maple, blackberry (*Rubus* spp.), ebony spleenwort (*Asplenium platyneuron*), and wild onion (*Allium* spp.). Several openings and a utility right-of-way were interspersed within the pine plantations, and these are dominated by broom sedge (*Andropogon virginicus*), blackberry, and various early succession herbs.

#### **4.6 Wildlife**

Land use and the type of land cover significantly influence the abundance and diversity of wildlife. In the vicinity of the proposed Hopkins Fold-In and 230-115kV Transmission Substation, bottomland and swamp forest, interspersed by pine plantations and fallow fields, provide suitable habitat for a wide range of wildlife species. The open areas and early succession areas (i.e., fallow fields and existing rights-of-way) provide feeding areas for birds such as the eastern meadowlark (*Sturnella magna*), field sparrow (*Spizella pusilla*), and eastern bluebird (*Sialia sialis*); small game such as cottontail rabbit (*Sylvilagus floridanus*), bobwhite quail (*Colinus virginianus*), and mourning dove (*Zenaidura macroura*); and reptiles such as the black racer (*Coluber constrictor*), rough green snake (*Opheodrys aestivus*), and the broadhead skink (*Eumeces laticeps*). Other species in these habitats include the golden mouse (*Ochrotomys nuttalli*) and the red-tailed hawk (*Buteo jamaicensis*). These areas provide food (seeds, insects, and small prey) as well as essential cover. The field borders offer nesting habitat and escape cover for birds such as the Carolina wren (*Thryothorus ludovicianus*), cardinal (*Cardinalis cardinalis*), eastern towhee (*Pipilo erythrophthalmus*), song sparrow (*Melospiza melodia*), and mockingbird (*Mimus polyglottos*).

The bottomland forests of the area offer habitat for gray squirrels (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus*), and wild turkey (*Meleagris gallopavo*). Other representative species found in the bottomland areas include the southern flying squirrel (*Glaucomys volans*), white-footed mouse (*Peromyscus leucopus*), opossum (*Didelphis virginiana*), common flicker (*Colaptes auratus*), red-eyed vireo (*Vireo olivaceus*), Carolina wren (*Thryothorus ludovicianus*), red-bellied woodpecker (*Melanerpes carolinus*), black and white warbler (*Mniotilta varia*), indigo bunting (*Passerina cyanea*), eastern box turtle (*Terrapene carolina*), southern toad (*Bufo terrestris*), and black rat snake (*Elaphe obsoleta obsoleta*). The swamp forest and lands adjacent to Mill Creek provide habitat for the beaver (*Castor*

canadensis), raccoon (*Procyon lotor*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), Carolina chickadee (*Poecile carolinensis*), red-headed woodpecker (*Melanerpes erythrocephalus*), northern parula warbler (*Parula americana*), prothonotary warbler (*Prothonotaria citrea*), brown water snake (*Nerodia taxispilota*), cottonmouth (*Agkistrodon picivorus*), gray tree frog (*Hyla versicolor*), green frog (*Rana clamitans melanota*), yellow bellied turtle (*Trachemys scripta*), barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), green heron (*Butorides striatus*), great blue heron (*Ardea herodias*), and great egret (*Casmerodius albus*).

Species of special concern in South Carolina, potentially occurring in the vicinity of the proposed Fold-In and Hopkins 230-115kV Transmission Substation, include the star-nose mole (*Condylura cristata*), southern hognose snake (*Heterodon simus*), and swamp rabbit (*Sylvilagus aquaticus*). Potential feeding areas for bald eagle (*Haliaeetus leucocephalus*) and Rafinesque big-eared bat (*Corynorhinus rafinesquii*) have been documented to occur in habitats similar to those existing in the vicinity of the proposed Fold-In and Hopkins 230-115kV Transmission Substation; however, habitats of these types are not critical to the survival of these species.

#### **4.7 Fisheries**

Most of the area's creeks are typical of coastal black-water streams and swamps, in that they support a community that is adapted to low acidity and dissolved oxygen concentrations that are sometimes low. Predator species common to these areas are largemouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), and bowfin (*Amia calva*). A variety of sunfish inhabit these waters including warmouth (*Lepomis gulosus*), bluegill (*L. macrochirus*), spotted (*L. punctatus*), and redbreast (*L. auritus*). Diadromous fishes, such as American shad (*Alosa sapidissima*), blueback herring (*A. aestivalis*), and American eel (*Anguilla rostrata*), utilize the Congaree River for spawning, and therefore have access to the lower reaches of Mill Creek for spawning.

#### **4.8 Rare, Threatened, or Endangered Resources**

Records of the South Carolina Heritage Trust Program and the United States Fish and Wildlife Service ("USFWS") were reviewed for data on rare, threatened and endangered species. State and federal records show no rare species within the vicinity of the proposed Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In, but several species could potentially be found in the project's immediate vicinity based on rare species locations in

Richland County, SC. Based on the USFWS lists, the species that could potentially occur (although no records of their occurrence exist) in the siting study area are the following:

- Rafinesque's big-eared bat (*Corynorhinus rafinesquii* - State endangered) is uncommon over its range that includes the southeastern US, west to the Mississippi River and portions of Missouri, Illinois, Indiana, Ohio, West Virginia, and Virginia. Rafinesque's big-eared bat roosts in small groups or singly, typically using abandoned buildings, hollow trees, and bridges (NatureServe 2004). Maternity colonies appear to use abandoned buildings (Harvey et al. 1999), while males are typically solitary during the nursing season. Foraging occurs in mature uplands and bottomlands for moths and other night-flying insects (Harvey et al. 1999). The only nearby record of Rafinesque's big-eared bat is from a bridge approximately 3-miles from the proposed project, where a single bat was observed. The siting study area includes foraging habitat for this species, but this habitat is plentiful in the area.
- Smooth coneflower (*Echinacea laevigata* – Federal endangered/State endangered) occurs in meadows and woodlands with basic or circumneutral soils (Radford et al. 1983), and is found in Georgia, North Carolina, South Carolina, and Virginia. Prime habitat for smooth coneflower has little competition with herbaceous species and profuse sunlight. Several records of smooth coneflower are from transmission line rights-of-way. Open areas in the siting study area did not support vegetation typically associated (diverse plants community associated with basic soils) with smooth coneflower, and no plants were observed. The closest record for smooth coneflower was approximately 15 miles from the siting study area. If habitat existed in the area, clearing and routine maintenance of the right-of-way for the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In would only improve habitat for this species.
- Bald eagle (*Haliaeetus leucocephalus* - Federal threatened/State endangered) is successfully populating large reservoirs and rivers of the Southeast. They are present at nesting sites in January, and young are fledged in May. Short migrations may occur to more southern latitudes in summer and fall when more northern birds migrate through South Carolina. Bald eagles generally prefer to nest in dominant large pines or cypress trees, and generally nest and feed near water (Russo and Sweeney 2000). Suitable feeding sites occur in the vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In, primarily in the swamps and canals that occur along the

proposed line route. The closest documented bald eagle nest site to the proposed Hopkins Fold-In and Hopkins Transmission substation is approximately 5-miles away.

- Pine Barrens tree frog (*Hyla andersonii* – State threatened) is found in Alabama, New Jersey, North Carolina and South Carolina. It is adapted to an interspersed of shrubs and herbaceous bogs or pocosins with adjacent upland oak and pines. Cely and Sorrow (1986) encountered pine barren tree frogs in utility rights-of-way and clear cuts; apparently disturbance is necessary to maintain their preferred habitat, as they are intolerant of closed canopies. The closest record for this species is from a seepage bog approximately 19-miles from the proposed project.
- Rough-leaved loosestrife (*Lysimachia asperulifolia* – Federal endangered/State endangered) is adapted to full sunlight at the edges of pond-pine pocosins on wet to seasonally saturated sand or deep peat soils of Carolina bays; it also has been found in roadside depressions, firebreaks, seeps, and powerline rights-of-way (Russo and Sweeney 2000). Timber harvests or fire are essential for its survival. The only reported occurrence in South Carolina is approximately 14-miles from the project; all other known populations occur in North Carolina.
- Canby's dropwort (*Oxypolis canbyi* – Federal endangered/State endangered) has been reported from the coastal plain of Delaware (extirpated), Maryland, North Carolina, South Carolina, and Georgia. Its habitat includes a variety of inundated habitats, including wet pine savannahs, pond cypress, pineland ponds and grass/sedge Carolina bays that are flooded and have an open canopy; it is important to maintain sufficient sunlight and an adequate water level for this species (NatureServe 2004). It is found approximately 9-miles from the proposed project.
- Red-cockaded woodpecker (*Picoides borealis* – Federal endangered/State endangered) occurs in the southeastern US. It requires open mature pine forests, and apparently prefers longleaf pine, with a sparse understory. Preferred habitat is maintained by periodic controlled burning or wildfires that keep the pine stand in an open "park-like" condition (Russo and Sweeney 2000). The primary habitat in South Carolina occurs in the Coastal Plain on dry uplands in the Sandhills. The red-cockaded woodpecker excavates a cavity in the mature, living pine promoting resin flow that generally protects the cavity from predators. Many of the occurrences of red-cockaded woodpeckers are



found on nearby Fort Jackson military base. The closest breeding colony occurs approximately 8-miles from the proposed project, and no habitat for red-cockaded woodpeckers is present in the immediate vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In.

#### **4.9 Cultural Resources**

The South Carolina Archives & History Center ("SCAHC") and the South Carolina Institute of Archaeology and Anthropology ("SCIAA") were contacted regarding cultural resources in the siting study area. The SCAHC database revealed that nine cultural resource sites have been recorded in the general vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In. Seven of the sites are recommended for additional investigation, but the site files on record at the SCIAA note that each of the seven sites have likely been destroyed by deep plowing. None of the seven sites will be affected by the proposed 230kV Fold-In or Transmission Substation. The eighth site is the Thomas Howell Plantation (c. 1740), which is listed as eligible for the National Record of Historic Places ("NRHP"). This site is located approximately 0.4-miles north of the proposed Hopkins Transmission Substation and will not be affected by the project. The ninth site is an excavated canal that links two portions of Mill Creek. It will be crossed by the proposed Hopkins 230kV Fold-In and is listed as potentially eligible for the NRHP, but according to an investigation along the future line's route by Archaeological Consultants of the Carolinas on April 13, 2004, it does not meet eligibility criteria.

#### **4.10 Visual Resources**

The visual characteristics of the vicinity surrounding the project area is typical of the Coastal Plain Province of South Carolina. Flat to gently sloping topography with shallow, meandering waterways that include cypress and tupelo swamps are common. The dominant visual features of the immediate area surrounding the proposed Hopkins 230-115kV Transmission Substation and 230kV Fold-In includes the Westinghouse Electric Company, LLC industrial complex, expansive pine plantations, forested swamps associated with the Congaree River floodplain, and agricultural fields (*Figures 3, 4, 5, and 6*).

While the overall visual quality of the area is good due to expansive, undeveloped land tracts surrounding the Westinghouse Electric Company, LLC industrial complex, there are no unique scenic features or designated scenic areas the vicinity of the future transmission

substation or fold-in. No opportunities for long-distance vistas exist in the vicinity of the Hopkins 230-115kV Transmission Substation and 230kV Fold-In due the extensive pine forest enclosure, flat topography, and lack of high-elevation points that would afford long views.

## **5.0 ENVIRONMENTAL CONSEQUENCES ASSOCIATED WITH THE PROPOSED ACTION**

The proposed Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will impact the immediate environment of the substation yard, transmission line structure locations, and line corridor where access roads to the line must be built. Other areas within the right-of-way will not be affected, except where trees must be removed in woodlands traversed by the route. Wetland and forest fragmentation impacts will be avoided and minimized to the maximum extent practicable. This chapter describes short and long-term impacts that will likely occur as a result of line and Transmission Substation construction.

### **5.1 Soils**

Soils within the proposed transmission line corridor and on the Transmission Substation lot (e.g., Persanti very fine sandy loam, Congaree loam, Chastain silty clay loam, Goldsboro sandy loam, Tawcaw silty clay loam, and Vacluse loamy sand) are moderately erodible ( $K=0.17$  to  $0.43$ ) (USDA 1978); however, the topography is generally flat, except at a few locations near the Westinghouse Electric Company, LLC industrial complex in the vicinity of Mill Creek. The potential for erosion exists, but is low where Transmission Substation grading, structure installation, and access road construction is required. Prudent construction and erosion-control measures will be used to avoid potential minor, short-term impacts. Grading and earthwork activities will comply with the South Carolina Stormwater Management and Sediment Reduction Act. SCE&G will use clearing, seeding, and erosion-control procedures that meet or exceed the standards set forth in local, state, and federal requirements. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas.

### **5.2 Water Resources**

The proposed route for the Hopkins 230kV Fold-In will cross a man-made canal, two drainage ditches, the headwaters of Mill Creek, and four forested wetlands (two are extremely small) (*Figure 6*). The crossing of three of the forested wetlands, man-made canal, and a ditch occur where the Hopkins 230kV Fold-In will run parallel with SCE&G's existing Westinghouse 115kV Line. The proposed line will not parallel any streams in a manner that will not allow a 25-foot buffer (minimum) between Mill Creek or the forested wetlands and the cleared line corridor. Construction of the Transmission Substation and Fold-In line will present minimal potential for

erosion and runoff contributions to surface waters and wetlands; however, SCE&G will carefully design measures and plan work to prevent any sediment-laden runoff beyond designed erosion-control devices (sediment basins, sediment traps, silt fences, etc.). SCE&G will comply with the SC Stormwater Management and Sediment Reduction Act related to water quality protection. All activities will be conducted in compliance with SCE&G's Best Management Practices and in a manner that will not jeopardize the State water quality standards and existing water uses. The erosion-control measures employed will be sufficient to prevent any sediment movement beyond construction limits during a 25-year storm event. Measures will also be taken to prevent sediment, trash, debris, and other man-made pollutants from entering sensitive areas.

Four wetlands associated with Mill Creek will be crossed by the proposed Hopkins 230kV Fold-In. Two locations are small swales within a bottomland hardwood forest. The line will also span two larger forested wetlands. At the larger wetlands, structures will be placed in adjacent uplands, and the line will span approximately 350 feet at one wetland and 600 feet at another wetland. Both of the longer wetland crossings occur in mature forested wetlands.

No access roads will be constructed in wetlands, and no wetlands will be affected by the substation. SCE&G will use selective, hand-clearing measures in the forested wetlands, leaving the root zone and as much low growing vegetation as possible in the buffer zones to prevent erosion, according to approved guidelines that outlines construction practices in wetlands (SCE&G Standard Operating Procedures—"Wetlands"). Only those trees that pose a current or potential safety problem (i.e., danger trees) will be removed. Only appropriate mechanized equipment will be allowed off the access roads or in wetlands. Before any clearing and earthwork begins, construction supervisors will be given plan-and-profile drawings for the project to provide them with locations of the structures and specific locations and requirements when working in all sensitive areas. All state and federal permits related to wetlands and water quality protection will be obtained before construction begins.

### **5.3 Flood-Prone Areas**

SCE&G reviewed the Federal Emergency Management Agency National Flood Insurance Program maps for Richland County to determine the extent of flood-prone areas in the siting study area (*Figure 7*). The Hopkins 230kV Fold-In will cross 500-year and 100-year flood zones associated with Mill Creek and the Congaree River. The proposed substation site is located in the 500-year flood zone, as is the northern 35% of the proposed line's route. The

southern portion of the proposed line route is located within the 100-year flood zone. Although structures must be placed in the 100-year flood zone, the single-pole construction that will be used on the Hopkins Fold-In do not pose significant obstacles for floodwaters and floating debris.

#### **5.4 Land Use**

The Hopkins 230kV Fold-In will restrict certain land uses from the right-of-way corridor, and the 6.89-acre substation site will be used exclusively for the Transmission Substation. The proposed line will cross approximately 3,200 feet of pine plantations, 1,100 feet of deciduous forests and drainage canals, 760 feet of forested wetlands, and 460 feet of croplands.

The substation's most significant affect on land use will be the conversion of a pine plantation to a barren, gravel pave area within the substation fence and a habitat outside the fence that is dominated by grass and herbaceous plants. The clearing along the 100-foot-wide Fold-In line right-of-way will replace portions of two swamp forests with scrub/shrub or emergent wetlands by removing danger trees in and along the right-of-way. Likewise, pine plantations will be replaced with herbaceous and scrub/shrub communities. Because only the area around the single-shaft poles will be removed from future agricultural use, the impacts to agricultural use will be minor. The line right-of-way will pose no other change where it crosses existing row-crop land and fallow land.

#### **5.5 Prime Farmlands**

Common soils in the vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In are the Tawcaw silty clay loam, Congaree loam, Chastain silty clay loam, Vaucluse loamy sand (6-10% slopes), Persanti very fine sandy loam and Goldsboro sandy loam (0-2% slopes). Information from the U.S. Department of Agriculture Natural Resources Conservation Service ("NRCS") was obtained concerning the presence of Prime Farmlands and Soils of Statewide Important in the siting study area. Based on the USDA definition, Prime Farmland is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The land could be cropland, pastureland, rangeland, forestland, but not urban built-up land or water. Prime Farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained management according to acceptable farming methods. Prime Farmlands are not excessively erodible or saturated with water for a long

period of time. Soils of Statewide Importance and Prime Farmland soils along the Fold-In line route include the following:

- Congaree (Statewide Importance)
- Goldsboro
- Persanti

All of the Congaree soil and some of the Persanti soils associated with the proposed line and substation are planted in pines. These areas will be taken out of production of pine forests. Goldsboro and one section of the Persanti soils that are crossed by the proposed line are being actively farmed for row-crops. Although the transmission line crosses these Prime Farmlands, agricultural uses will not be measurably affected due to the small footprint of the single-pole structures.

While some soils in the proposed corridor have moderate erosion potential, the topography is such that only one small area includes soil with slopes greater than 2%. SCE&G has had substantial experience in constructing transmission lines in these situations. Minimizing the amount of disturbed land, minimizing the construction period, quickly establishing groundcover, and leaving buffers along stream/wetlands and areas of concentrated flows are keys to success. Prudent construction and erosion-control measures will be used to avoid minor, short-term impacts to soils.

## **5.6 Wetlands**

Wetlands are defined by 33 CFR Part 328 and protected by Section 404 of the Clean Water Act. The Hopkins 230kV Fold-In route crosses four wetlands. These crossings are not expected to require a Section 404 Corps of Army Engineers permit. Two wetlands are very small and located in a bottomland and require no mechanized clearing; single pole structures can be accessed without crossing wetlands, and structures can be placed in adjacent uplands. The proposed route will also cross two forested wetlands and no structures or access roads will be placed in them. The two large wetlands (one is 300'-in length; one is 600') will also be spanned. Trees in all wetlands will be hand cut, leaving their root zone intact; low growing vegetation will be left intact to the extent practical.

Typical line construction requires minimal disturbance to wetlands and does not convert wetlands to uplands. Various techniques, such as selective clearing near watercourses and wetlands and leaving the root zone and as much low growing vegetation as possible in buffer

zones, are successful in preventing impacts to waters and wetlands. Although the removal of any vegetation from the right-of-way affects the existing plant and animal community, the impact will be minimal and confined to the immediate right-of-way and adjacent areas where removal of danger trees is required. During the field survey along the selected route, wetland boundaries were delineated pursuant to the U.S. Army Corps of Engineer's delineation methodology (Environmental Laboratory 1987), and will be surveyed and recorded on plan-and-profile drawings so construction crews can locate these areas for special treatments.

## **5.7 Rare, Threatened, and Endangered Resources**

In an inventory of a 300-foot wide corridor along the proposed route (the 100'-wide right-of-way and 100' on each side), SCE&G found no State or Federally listed species, no unique habitats, and no species of importance to the US Fish and Wildlife Service or the SC Department of Natural Resources (see Section 4.8). Potential foraging habitat for the bald eagle and Rafinesque's big-eared bat occurs in the siting study area, but clearing of the right-of-way and construction of the line will not substantially impair this habitat. Smooth coneflower (Federal endangered), pine barrens tree frog (State threatened), and rough-leaved loosestrife (Federal endangered) have been found in transmission corridors in other areas of the country and, apparently, habitat for these species is enhanced by the routine removal of tall vegetation from their locations. Likewise, Canby's dropwort (Federal endangered) requires abundant sunlight, and if potential habitat occurred in the area, routine removal of competing tall vegetation would promote the expansion of the habitat.

Another issue that is associated with rare, threatened, or endangered birds such as the bald eagle and peregrine falcon, as well as other raptors, is their vulnerability to power line electrocution. Their large size and perching behavior during hunting make them susceptible to electrocution on certain transmission pole designs. Power poles with inadequate spacing between phases (i.e., less than 60 inches of separation between conductors and/or grounded hardware) can cause raptor electrocutions.

With this in mind, the U.S. Fish and Wildlife Service has recommended, under authority of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act, that all new electrical power structures be equipped with design features that prevent raptor electrocutions. These features typically include designs that (1) make the distance between phase conductors greater than the wingspread of the bird that is landing, perching, or taking off; and (2) increase the distance

between grounded hardware (e.g., ground-wires) and an energized conductor to more than the largest bird's wingspread or the distance from the tip of the bill to the tip of the tail. The 230kV steel or concrete poles that will be used on the Hopkins 230kV Fold-In are "raptor safe" and will meet the guidelines recommended in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996). The design of clearances, phase to phase and phase to ground, will allow safe perching on conductors, ground wire and all pole hardware. All clearances will meet or exceed the recommended minimum of 60-inches. Thus, raptor electrocutions are not anticipated on this project.

## **5.8 Cultural Resources**

SCE&G contracted with a cultural resources consultant, Archaeological Consultants of the Carolinas, LLC ("ACC"), to review the maps and records of the South Carolina Institute of Archaeology and Anthropology and the SC Department of Archives and History to determine and report on any documented, significant cultural resources in the vicinity of the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In. Based on the records compiled by ACC, no cultural resources will be affected by the Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In. ACC also conducted an intensive cultural resources investigation within the entire length of the right-of-way and over the entire substation lot and found no previously unrecorded cultural resources. The results of the investigation conducted by ACC was contained in a report entitled *Archaeological Survey of the Hopkins Transmission Line and Substation, Richland County-Final Report* and forwarded to the SC Archives and History Center. In a letter dated, April 24, 2004, the SC Archives and History Center notified SCE&G that no further cultural resource investigations are recommended and that the project will not likely affect cultural resources (*Appendix C*). When Transmission Substation and line construction begins, any discovery of archaeological resources will be reported immediately to the SC Archives and History Center, and construction will be suspended in the immediate area until an investigation can be completed that includes a plan to protect and preserve artifacts.

## **5.9 Visual Resources**

The visual implications of substations and transmission lines are influenced by several factors. These include the distance from the viewer, the number of structures viewed, whether visible structures are seen against backdrops (vegetation, terrain, man-made elements) or silhouetted against the skyline, the degree of foreground elements that will offer screening, the



amount of vegetative modification which contrasts with surrounding landscapes, and the overall scenic condition (landscape content or context) of the area in which the facility is seen. The potential visual implications of the project were carefully evaluated during the siting process to select a Transmission Substation site and Fold-In line route that minimize visibility from roads and residences.

Visual considerations are significant factors in selecting substation sites, developing alternate routes, and making comparisons among them. When selecting the Hopkins 230-115kV Transmission Substation site and Hopkins 230kV Fold-In route, their visual recognition when viewed from public roads and residences was considered.

The Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will be located in a remote rural area and will not be visible from any public roads or from any residences.

#### **5.10 Aviation**

Two private airstrips/airports located in close proximity to the future Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In; however, neither will reside in airspace that is with any FAA approved airport master plan. No portion of the electrical facilities will be in excess of 200' above ground level.

#### **5.11 Noise, Radio, and Television Interference**

The proposed Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In could, under severe weather conditions (e.g., very windy or wet conditions), operate with a low level of sound; however, this sound is normally not audible beyond the limits of the substation property, nor outside the line right-of-way limits. There will be some noise during the clearing and construction phases of the project, but it will be localized and temporary. Thus, noise generated by the line will cause no long-term adverse effects.

There are no radio transmission towers in the vicinity of the project, and the line will have no adverse effects on television or radio reception in the area.

## **5.12 Safety**

To provide for public safety and protection, SCE&G will design and construct the proposed substation and transmission line in a manner that will comply with, or exceed, all standards of the National Electrical Safety Code in effect at the time of construction. Also, SCE&G commits to continue their long-standing tradition of operating and maintaining their facilities in a manner that will ensure public safety over the life of these facilities.

## **5.13 Electric and Magnetic Fields**

Electric and magnetic fields ("EMF") exist anywhere there is electricity, whether that electricity is being produced, distributed, or consumed. Thus, EMF is created by power lines, residential wiring, appliances, and even by the earth itself. Since the early 1970's, hundreds of studies have debated the possible health effects of EMF. In 1996, the National Academy of Sciences ("NAS"), National Research Council, completed its review of the literature on the possible health risks of residential exposure to power-frequency electric and magnetic fields. In 1999, the National Institute of Environmental Health Sciences ("NIEHS") completed a comprehensive program of research and analysis to clarify the potential health risks from exposure to extremely low frequency electric and magnetic fields.

The NAS report stated, "Based on a comprehensive evaluation of published studies relating to the effects of power frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard." The NAS went on to say, "No conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."

NIEHS concluded that the evidence for a risk of cancer and other human disease from the electric and magnetic fields around power lines is "weak." They stated that "The results of the EMF-RAPID program do not support the contention that the use of electricity poses a major unrecognized public-health danger." NIEHS Director Kenneth Olden, Ph.D., said, "The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to EMF, but it cannot completely discount the epidemiological findings. For that reason, and because virtually everyone in the United States is routinely exposed to EMF, efforts to encourage reductions in exposure should continue."

The relationship between EMF and distance serves to minimize exposures. EMF levels drop sharply with increased distance from a power source. For the substation, the EMF level at the substation fence line will probably be lower than background levels typically found in homes. Similarly, the field levels at the edge of the right-of-way under normal electrical load conditions will likely be comparable to background levels found in homes. Therefore, since there will be relatively low EMF field-strength levels associated with this project, and since the consensus is that EMF exposure does not pose a human health hazard, no adverse impact can be anticipated.

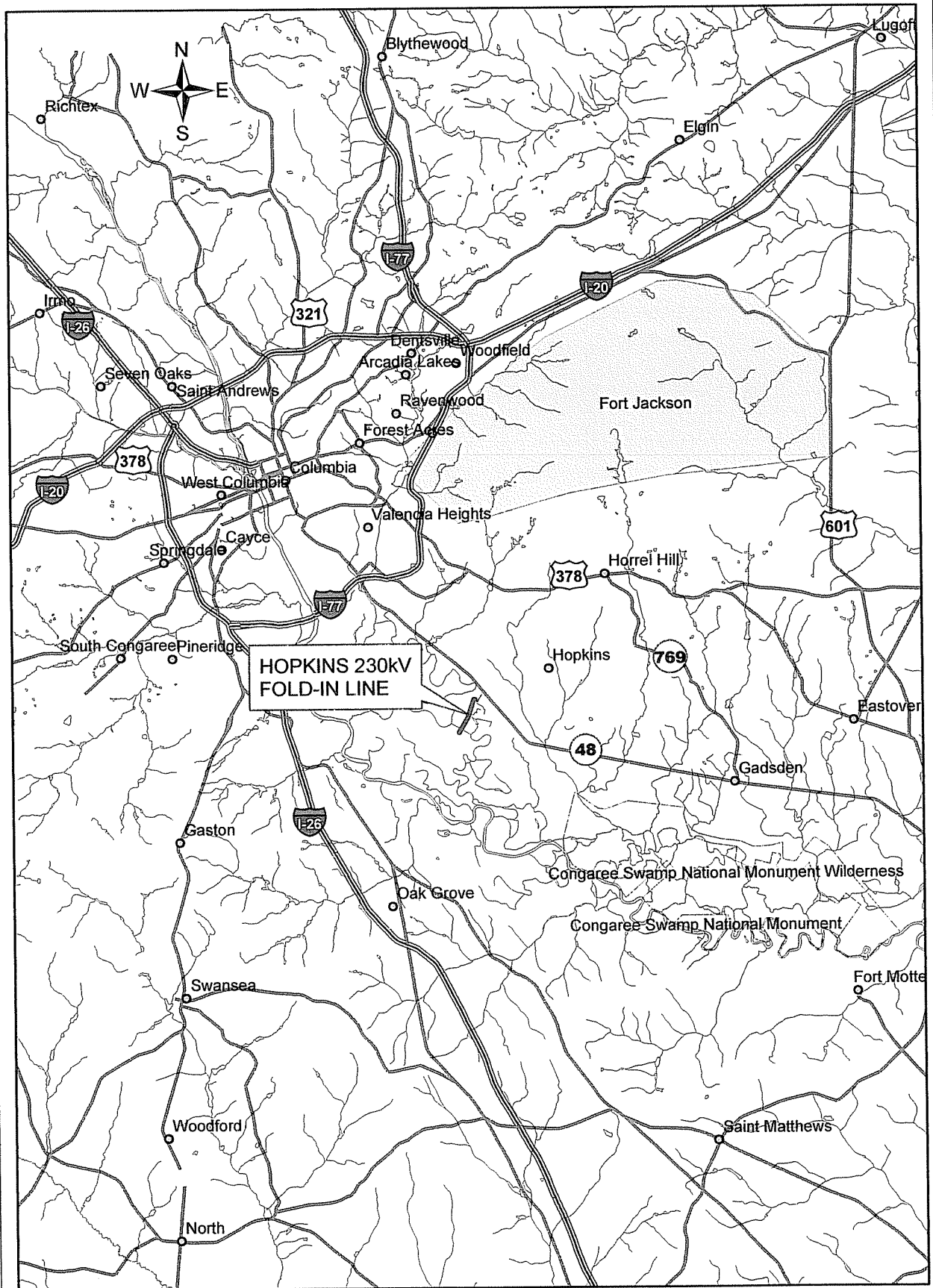
#### **5.14 Ozone**

High-voltage transmission facilities may, under some conditions, produce small amounts of ozone as a consequence of corona discharge. This discharge is caused by abrasions on conductors or foreign-particle contamination of the insulators or hardware. SCE&G takes care to eliminate or minimize corona discharge from random arcing through careful design of the connections, fittings, hardware, and insulation.

Organizations such as the Illinois Institute of Technology have conducted extensive field tests under various weather conditions to detect ozone around high-voltage substations and 765kV lines. These tests showed no significant adverse effects on plants, animals, or humans from levels of ozone that may be produced in operating transmission facilities at voltages up to 765kV.

The Hopkins 230-115kV Transmission Substation and Hopkins 230kV Fold-In will not produce any detectable amount of ozone under any operating condition, and thus it poses no threat to environmental quality.

## FIGURES



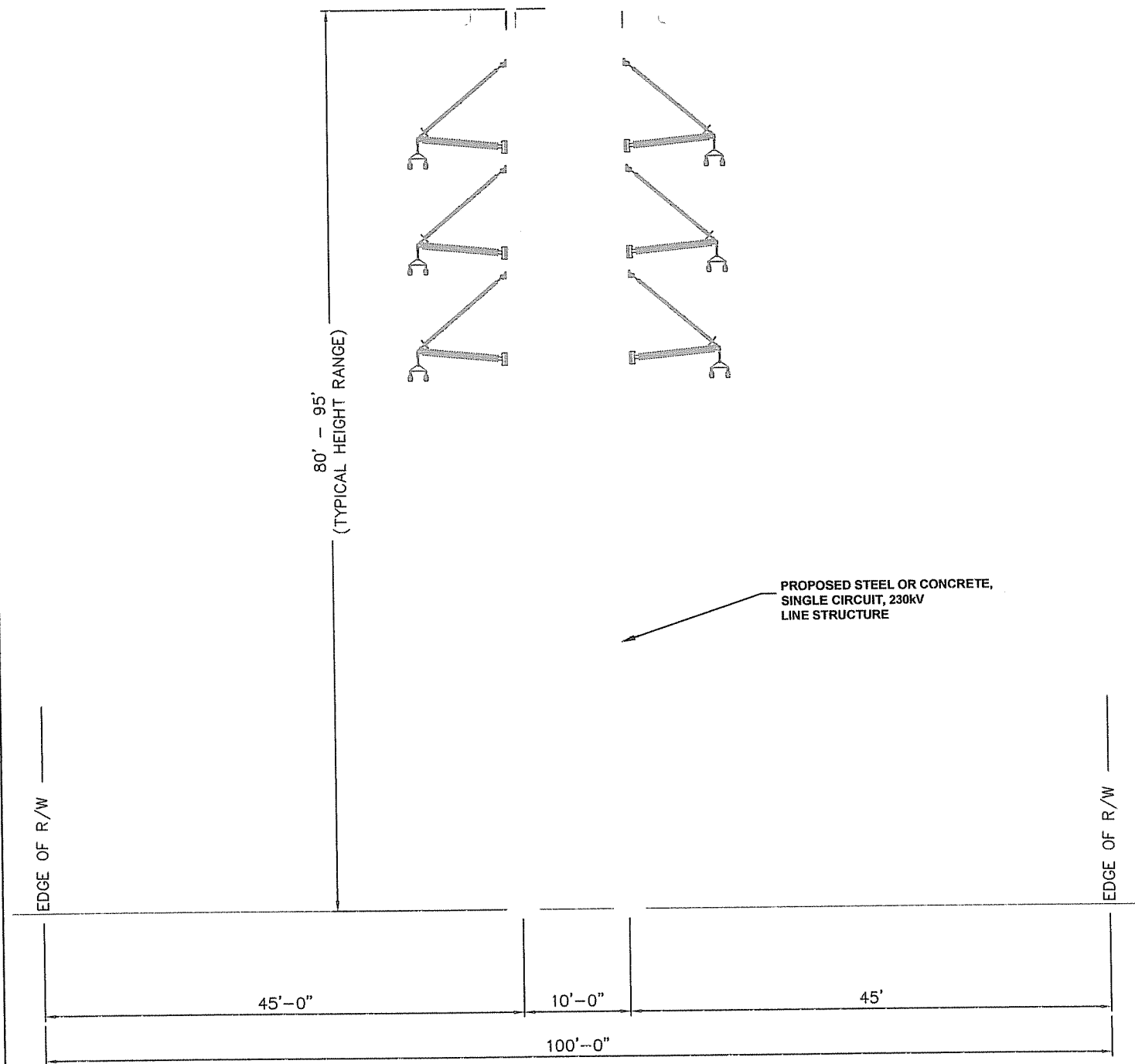
**HOPKINS 230kV FOLD-IN LINE  
PROJECT LOCATION MAP**



**A**  
**FRAMATOME ANP**

0 2.5 5 10 15 Miles

**FIGURE 1**



**TYPICAL CROSS-SECTION  
HOPKINS 230kV FOLD-IN LINE**



**FIGURE 2**

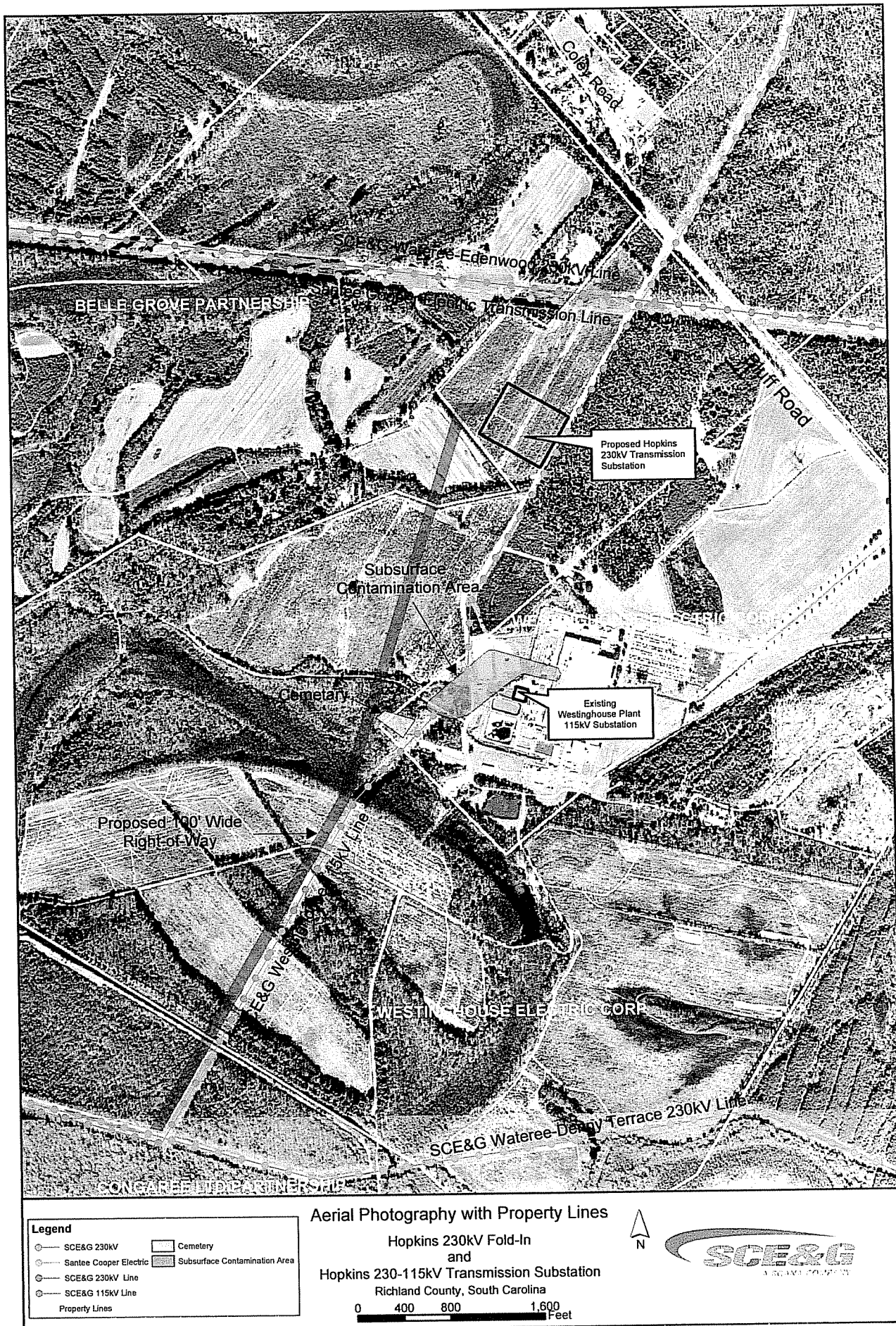


FIGURE 3



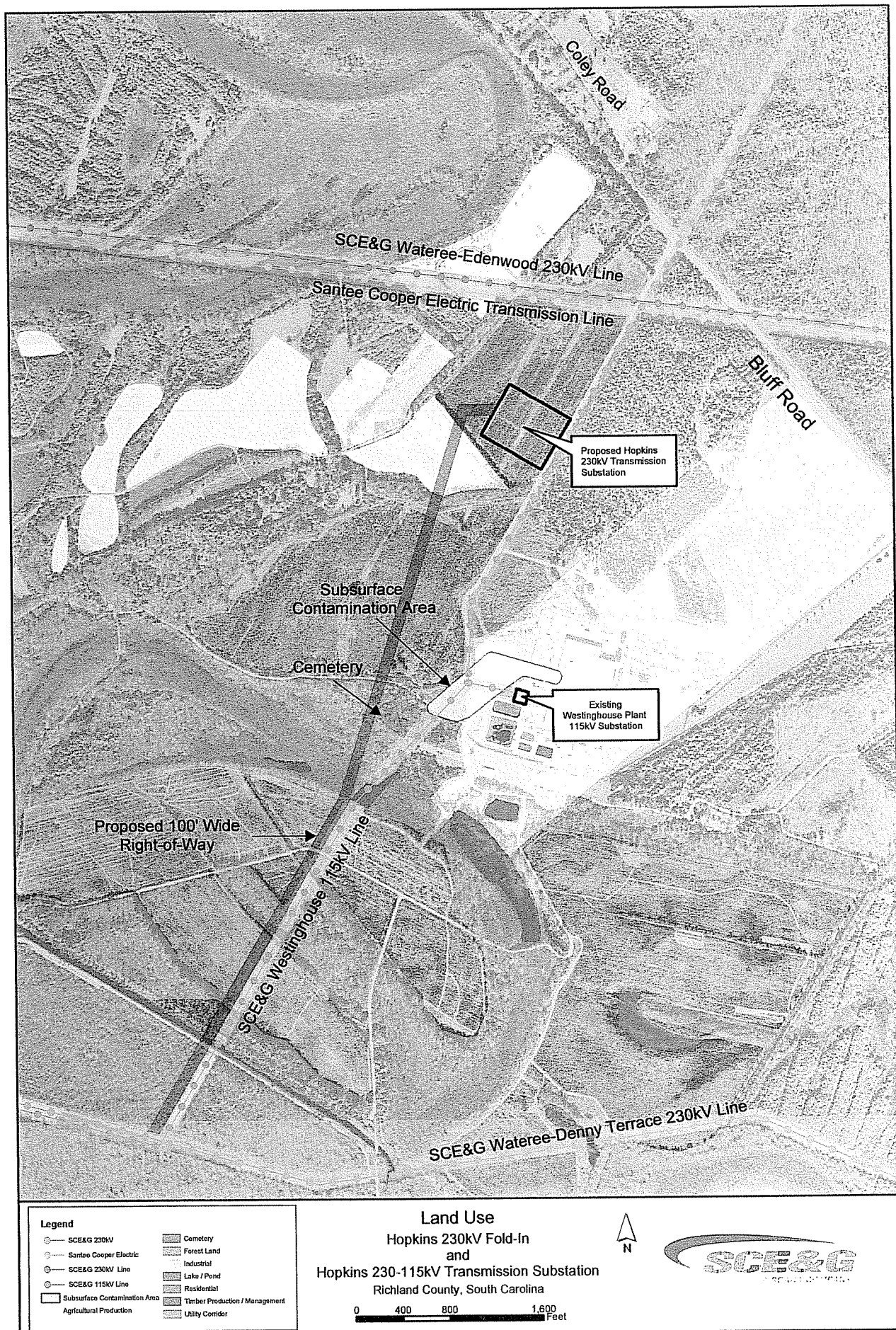


FIGURE 4



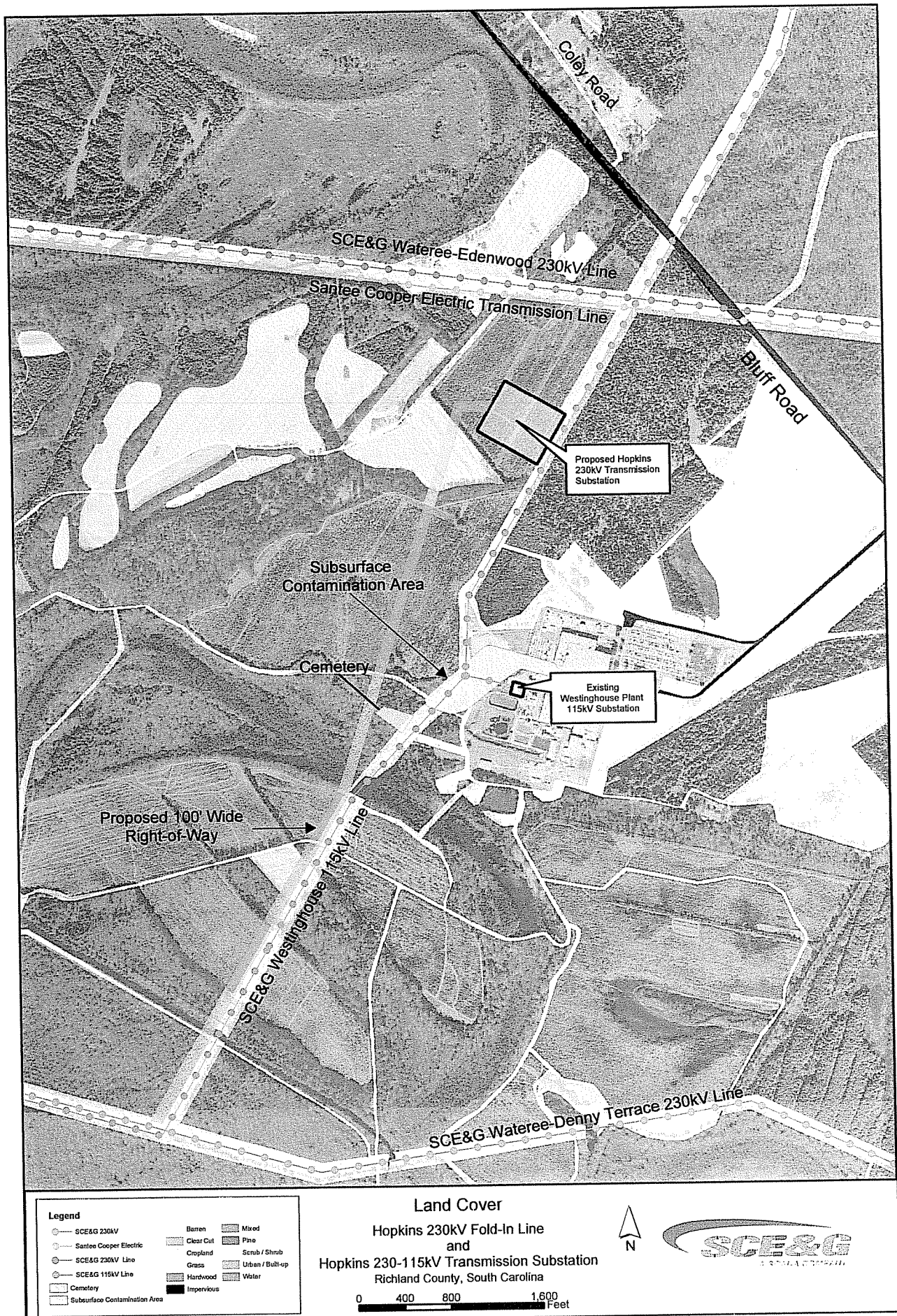


FIGURE 5

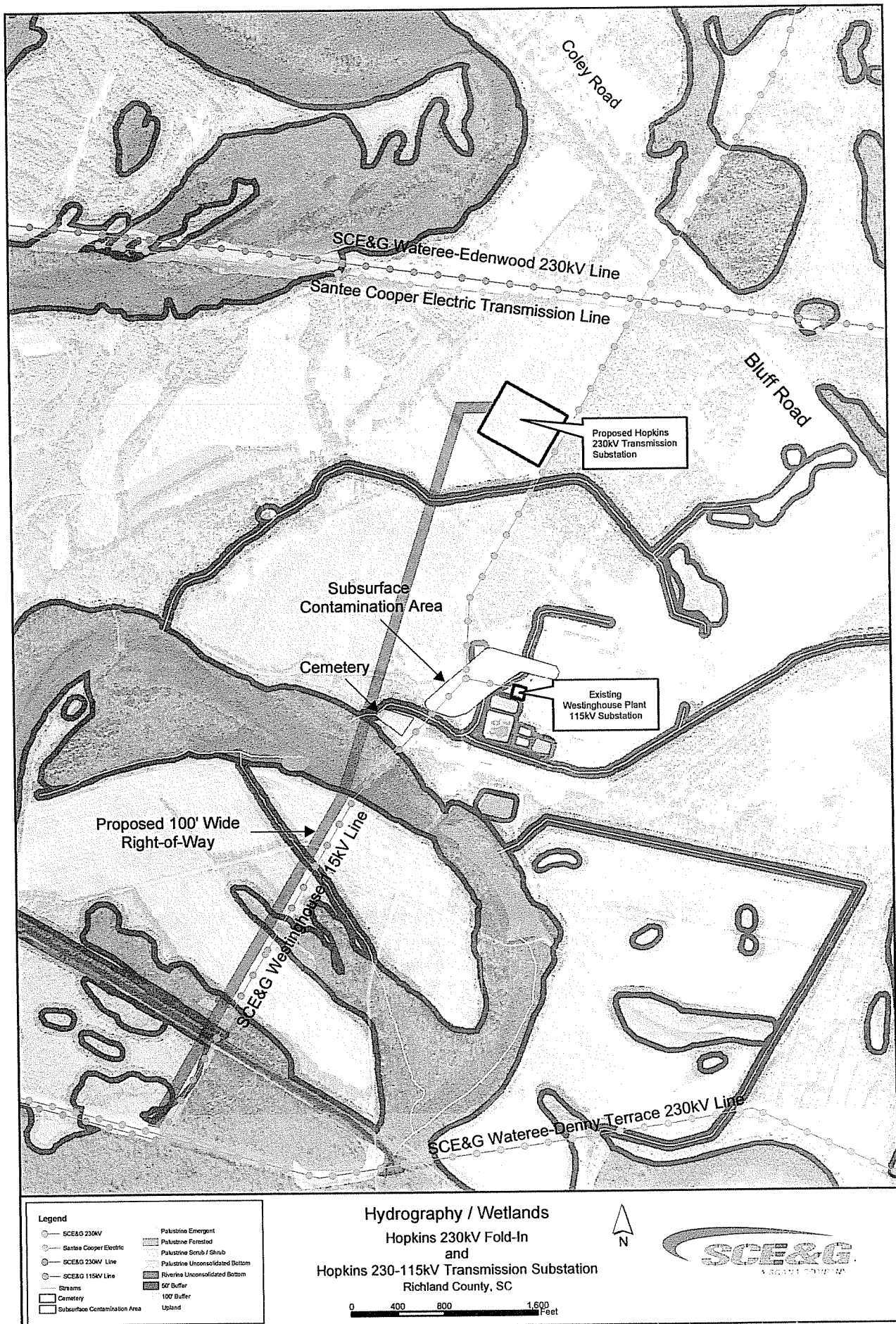


FIGURE 6



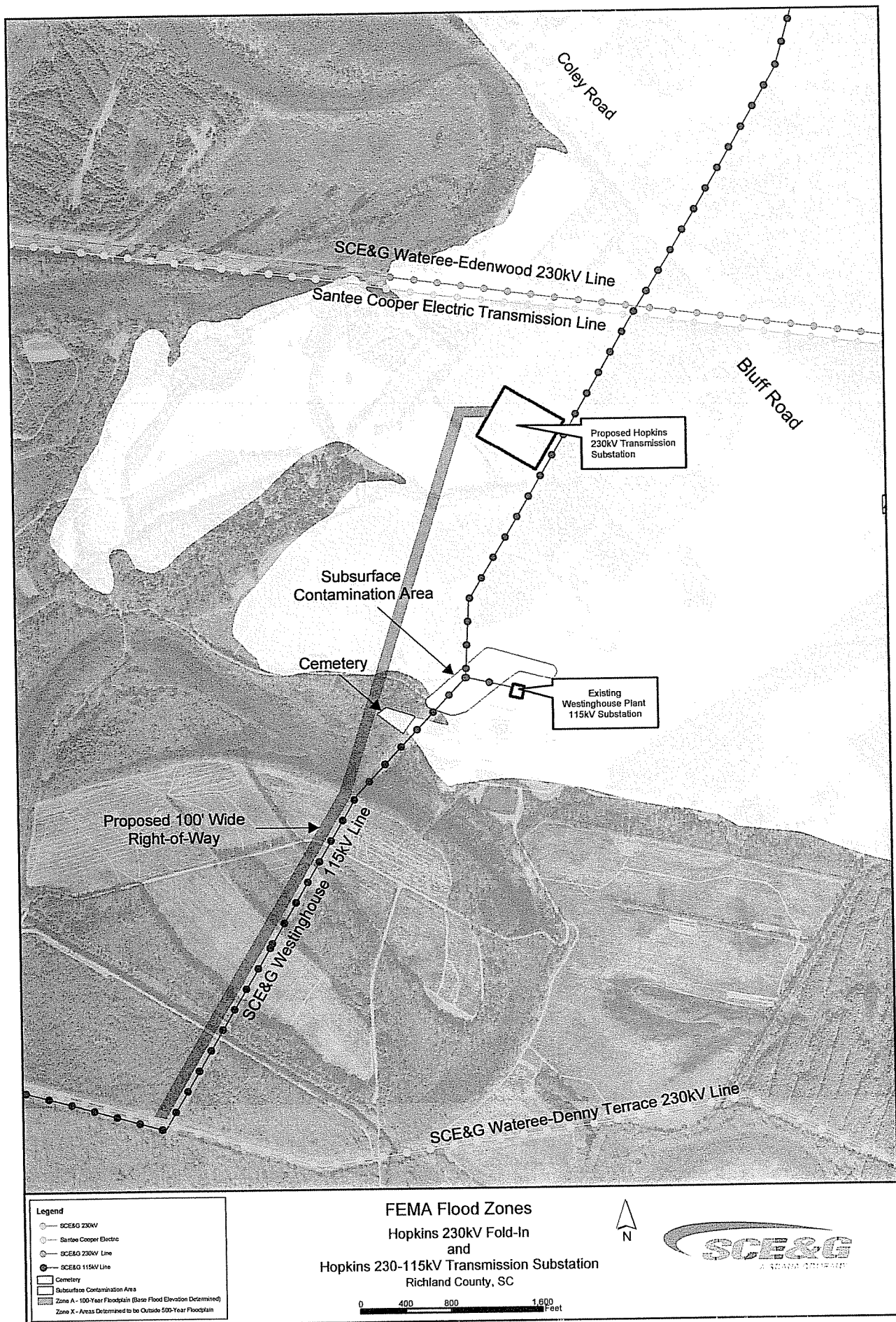


FIGURE 7

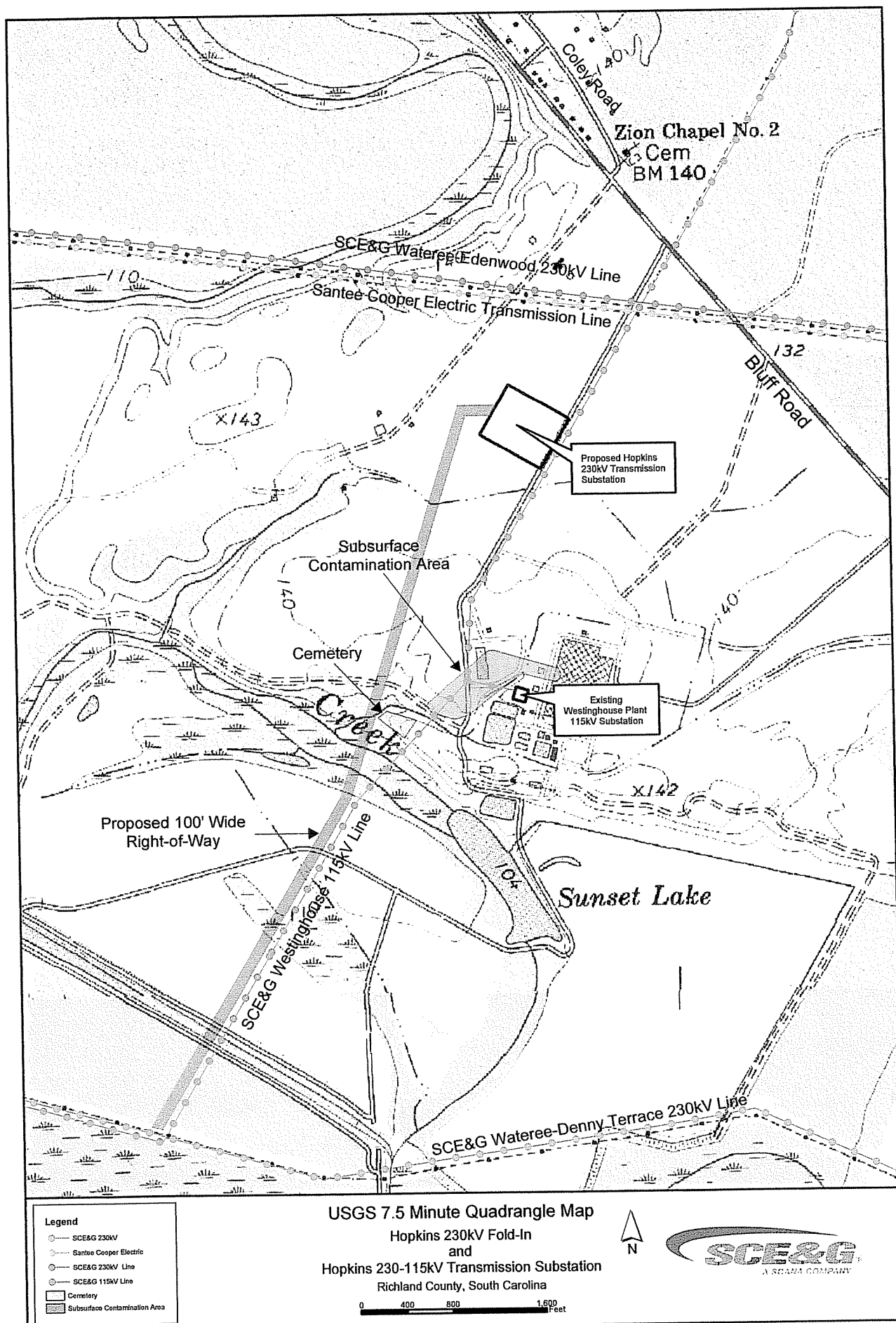


FIGURE 8

## APPENDIX A

### DATA SOURCES, AGENCIES CONSULTED, AND REFERENCES

## DATA SOURCES and REFERENCES

### Data Sources

South Carolina Department of Archives and History  
South Carolina Department of Health and Environmental Control  
South Carolina Department of Natural Resources, Heritage Trust Program  
South Carolina Institute of Archaeology and Anthropology, University of South Carolina  
South Carolina Department of Archives and History  
Federal Emergency Management Agency  
U.S. Army Corps of Engineers  
U.S. Geological Survey, National Aerial Photography Program  
U.S. Geological Survey, 7.5' Quadrangle Map Series  
U.S. Fish and Wildlife Service, National Wetlands Inventory, SC Listed Species by County  
U.S. Department of Agriculture, Natural Resources Conservation Service  
U.S. Department of Interior, Fish and Wildlife Service

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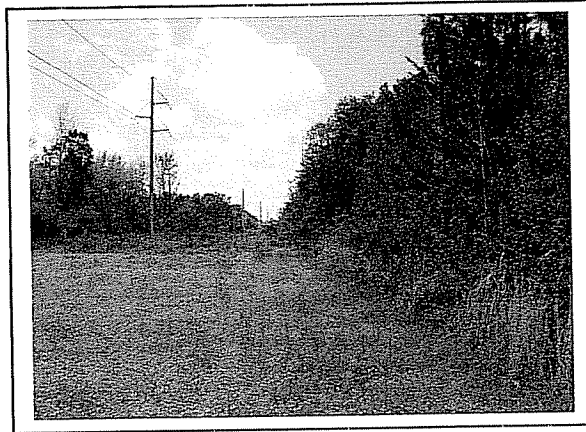
## APPENDIX B

### BIOLOGICAL SURVEY REPORT



# ***SOUTH CAROLINA ELECTRIC & GAS***

*Columbia, South Carolina 29218*



## ***BIOLOGICAL SURVEY REPORT FOR THE PROPOSED HOPKINS 230-115KV TRANSMISSION SUBSTATION AND 230KV FOLD-IN***

*May 2004*

*Prepared by:*

*Environmental Resources of the Carolinas  
7550 Forest Oak Drive  
Denver, NC  
(704) 483-0972*

## **Table of Contents**

|            |  |          |
|------------|--|----------|
| <b>1.0</b> | <b>INTRODUCTION</b>                            | <b>1</b> |
| <b>2.0</b> | <b>STUDY METHODS</b>                           | <b>2</b> |
| 2.1        | Wetlands and Water Crossings                   | 2        |
| 2.2        | Rare, Threatened, and Endangered (RTE) Species | 2        |
| <b>3.0</b> | <b>SURVEY RESULTS</b>                          | <b>3</b> |
| 3.1        | Wetlands                                       | 3        |
| 3.2        | Water Crossings                                | 3        |
| 3.3        | Vegetative Communities                         | 4        |
| 3.4        | Rare, Threatened, and Endangered (RTE) Species | 6        |
| 3.5        | Other Resources of Note                        | 8        |
| <b>4.0</b> | <b>LITERATURE CITED</b>                        | <b>9</b> |

## **FIGURES and APPENDICES**

|            |   |    |
|------------|---|----|
| FIGURE 1   | Location Map of Wetlands and Stream Crossings   | 10 |
| APPENDIX A | Wetlands Data 1 Forms and Photographs of Waters | 11 |
| APPENDIX B | Photographs of Vegetative Communities           | 20 |
| APPENDIX C | South Carolina Species of Concern               | 25 |

## **1.0 INTRODUCTION**

South Carolina Electric & Gas is proposing to build a new Hopkins Transmission Station and Fold-In that will be located in Richland County, SC, 10 miles southeast of Columbia, South Carolina, and 8.5 miles southeast of the intersection of I-77 and Highway 48. The substation will be named the Hopkins 230kV-115kV Transmission Substation ("Hopkins Transmission Station") and the line will be called the Hopkins 230kV Fold-In ("Fold-In" or "230kV Fold-In"). The closest town is Hopkins, SC, which is 2.5 miles to the northeast of the study area. The proposed facilities will be located largely within the Westinghouse Electric Corporation's Nuclear Fuel Division facility grounds.

This biological assessment will address wetlands, streams, vegetation communities, and rare species of the proposed Hopkins Transmission Station site and a 300-foot wide study corridor along the proposed route for the Fold-In.

## **2.0 STUDY METHODS**

A biological field survey was conducted on April 13, 2004 to document specific resources affected by the proposed 230kV Fold-In and transmission substation. Resources assessed during this effort included wetlands, plant communities, waters crossings, and rare, threatened, and endangered species ("RTE"). The following report provides a summary of the field survey findings.

### **2.1 Wetlands and Water Crossings**

During the field survey, potential wetlands within the proposed 230kV Fold-In corridor and Hopkins Transmission Substation were evaluated using the 1987 US Army Corps of Engineers "Routine On-Site Determination Method" (Environmental Laboratory 1987). Wetlands were considered present when observations of vegetation, hydrology, and soils indicated that the three-parameter criteria for wetland identification were met. Any wetland boundaries that were found were marked in the field with survey ribbon, photographed, and data collected to characterize the wetland (i.e. Data 1 Forms).

Perennial and/or intermittent stream crossings were also noted during the field survey, mapped on U.S.G.S. 7.5-minute quadrangles (*Figure 1*), and photographed (*Appendix A*). Information such as stream width, depth, substrate and discharge were recorded at each crossing.

### **2.2 Rare, Threatened, and Endangered (RTE) Species**

Archives from the South Carolina Heritage Trust Program and the United States Fish and Wildlife Service ("USFWS") were reviewed prior to conducting the field investigation to determine the likelihood of rare, threatened, and endangered species ("RTE") species and species of concern in the project area (*Appendix C*). Agency databases were augmented through direct observations made during the biological field survey conducted on April 13, 2004. The entire length of a 300-foot wide corridor along the proposed 230kV Fold-In and the 6.89-acre Hopkins Transmission Station site were walked and any likely habitats (e.g., wetlands, stream margins, forested slopes, etc.) were searched for likely species. Search methods were intensified in areas of high potential. Vegetative communities were classified through the use of the *Natural Communities of South Carolina* (Nelson 1986).

### 3.0 SURVEY RESULTS

#### 3.1 Wetlands

It was determined during the biological field survey that the proposed 230kV Fold-In route crosses four wetlands areas (Table 1). Wetlands 1 and 2 consist of two small wetland inclusions in a ditched and drained bottomland forest (*Appendix A*). Wetlands 3 and 4 are forested wetlands (*Appendix A*). No wetlands are located at the 6.89-acre Hopkins Transmission Station site or in the Fold-In study corridor north of Mill Creek.

**Table 1**  
**Hopkins 230kV Fold-In Wetlands Crossing Data**

| Wetland Number  | Wetland Type | Wetland Location (in relation to line survey stations) <sup>1</sup> | Associated Stream           | Approximate Length | Principle Functions   |
|---|--------------|---|-----------------------------|--------------------|---|
| W-1   | PFO1A        | Approximately 400 to 460 Feet                                       | Unnamed ditch to Mill Creek | 60 Feet            | Floodflow alteration  |
| W-2   | PFO1A        | Approximately 600 to 630 Feet                                       | Unnamed ditch to Mill Creek | 30 Feet            | Floodflow alteration  |
| W-3   | PFO1F        | Approximately 1075 to 1375 Feet                                     | Manmade Canal to Mill Creek | 300 Feet           | Groundwater recharge, Floodflow alteration, Nutrient reduction, Production export, Wildlife diversity |
| W-4   | PF01H        | Approximately 3400 to 4000 Feet                                     | Mill Creek                  | 600 Feet           | Groundwater recharge, Floodflow alteration, Nutrient reduction, Production export, Wildlife diversity |
| <sup>1</sup> Approximate distance in feet from the proposed tap point |              |   |                             |                    |   |

#### 3.2 Water Crossings

The only stream in the study area is Mill Creek with its many meanders and drainage canals. The South Carolina Department of Health and Environmental Control (2004) reports that Mill Creek and associated wetlands and tributaries are affected by groundwater contamination from various spills and leaks at the Westinghouse facility; a groundwater remediation program is underway. Mill Creek water quality monitoring data suggest that the

creek is fully supporting aquatic life, but is only partially supporting recreation uses because of fecal coliform bacteria excursions at one of two monitoring sites (SCDHEC 2004). The proposed Fold-In route crosses two drainage canals that were inundated with water at the time of the inventory, and two dry drainage ditches. The Fold-In will also cross Mill Creek, a tributary of the Conagree River (*Appendix A*).

**Table 2**  
**Hopkins 230kV Fold-In Water Crossing Data**

| Waters                                      | Status            | Approximate Stream Location <sup>1</sup> | Stream Width                          | Stream Depth | Flow (Estimated) | Substrate                   |
|---|-------------------|--|---------------------------------------|--------------|------------------|-----------------------------|
| S-1<br>Unnamed drainage canal to Mill Creek | Perennial Channel | 960                                      | Approximately 15 feet wide            | >12 inches   | No observed flow | Sand/Leaves                 |
| S-2<br>Unnamed drainage canal to Mill Creek | Perennial Channel | 2000                                     | Approximately 7 feet wide             | >12 inches   | No observed flow | Sand/Leaves                 |
| S-3<br>Unnamed ditch to Mill Creek          | Dry Channel       | 2700                                     | Approximately 4 feet wide             | N/A          | Dry              | Sand/Terrestrial Vegetation |
| S-4<br>Mill Creek                           | Perennial Stream  | 4000                                     | 77-inches wide (channel 15-feet wide) | 2 inches     | <1 c.f.s.        | Sand/Gravel                 |
| S-5<br>Unnamed ditch to Mill Creek          | Dry Channel       | 6100                                     | Approximately 4 feet wide             | N/A          | Dry              | Sand/Terrestrial Vegetation |

<sup>1</sup> Approximate distance in feet from the proposed tap point

### 3.3 Vegetative Communities

#### *Hopkins 230kV Fold-In Corridor*

The proposed 230kV Fold-In will be built adjacent to SCE&G's existing Westinghouse 115kV Line for approximately 0.64-miles, where it will occupy a new 100'-wide right-of-way adjacent and parallel to SCE&G's existing 100'-wide right-of-way. The Fold-In will then turn away from the existing line and head in a more northerly direction for approximately 0.68-miles to the Hopkins Transmission Station site, crossing a forested wetland associated with Mill Creek, a pine plantation, and an agricultural field. The right-of-way along the 0.68-mile segment will be 100'-wide, as well.

Two natural vegetative communities are found along the Fold-In route. These communities are the Bald Cypress-Tupelo Gum Swamp and the Bottomland Hardwood Forest (Nelson 1986). Managed vegetation communities also occur and include pine plantations, agricultural fields, rights-of-way, and early succession fields. See *Appendix B* for photographs of vegetation communities along the proposed Fold-In route.

The Bald Cypress-Tupelo Gum Swamp Forest (Nelson 1986) occurs in and adjacent to Mill Creek. Here, bald cypress was absent from this community, and tupelo gum (*Nyssa aquatica*) was a dominant species along with red maple (*Acer rubrum*), and ash (*Fraxinus* spp.). This community was inundated with water and contained few herbaceous species (Wetlands 3 and 4 are tupelo gum swamp forests). Sweet-gum (*Liquidambar styraciflua*), cherrybark oak (*Quercus falcata* var. *pagodaefolia*), swamp chestnut oak (*Q. michauxii*), and American elm (*Ulmus americana*) commonly bordered the swamp forest. Common shrubs include Virginia willow (*Itea virginica*) and poison sumac (*Toxicodendron vernix*); swamp forest borders contained privet (*Ligustrum sinense*), ironwood (*Carpinus caroliniana*) and deciduous holly (*Ilex decidua*). Herbaceous vegetation included lizard's tail (*Saururus cernuus*), duckweed (*Lemna* spp.), duck-potato (*Sagittaria* spp.), ragwort (*Senecio glabellus*) and jack-in-the-pulpit (*Arisaema triphyllum*).

Bottomland Forests are also found in association with the swamp forests (i.e. Wetlands 1 and 2 are inclusions in the bottomland forest), and in some cases were the result of past ditching of the swamp forests. Primary trees in this community are cherrybark oak, swamp chestnut oak, sweet-gum, red maple, willow oak (*Q. phellos*), water oak (*Q. nigra*), American elm, and hackberry (*Celtis laevigata*). Understory trees and shrubs are box elder (*Acer negundo*), ironwood, pawpaw (*Asimina triloba*), American holly (*Ilex opaca*), elderberry (*Sambucus canadensis*) and deciduous holly. The bottomland hardwoods have an abundance of woody vines including crossvine (*Bignonia capreolata*), Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax roundifolia*), poison ivy (*Toxicodendron radicans*), honeysuckle (*Lonicera japonica*), and trumpet vine (*Campsis radicans*). Common herbs were sedges (*Carex* spp.), green dragon (*Arisaema dracontium*), yellow harlequin (*Corydalis flavula*), Atamasco lily (*Zephyranthes atamasco*), and cane (*Arundinaria gigantea*).

Several managed plant communities exist along the Fold-In route. The most common is the pine plantation, which was planted with loblolly pines (*Pinus taeda*); these plantations were less than ten years old and contained little vegetation except pines, except for sweet-gum, red

maple, blackberry (*Rubus* spp.), ebony spleenwort (*Asplenium platyneuron*), and wild onion (*Allium* spp.). Several openings and a utility right-of-way were interspersed within the pine plantations, and these are dominated by broom sedge (*Andropogon virginicus*), blackberry, and various early succession herbs.

### ***Hopkins 230-115 kV Transmission Substation***

The plant community associated with the proposed Hopkins Transmission Station site is a recently cleared pine plantation (*Appendix B*). No specialized habitats are present and no rare, threatened, or endangered species were found.

### **3.4 Rare, Threatened, and Endangered (RTE) Species**

A field inventory along the Fold-In route and 6.89-acre Hopkins Transmission Station site failed to find any rare, threatened or endangered species. Records of the South Carolina Heritage Trust Program ("SCHTP") and the United States Fish and Wildlife Service ("USFWS") were reviewed for data on rare, threatened and endangered species. State and federal records show no rare species within the immediate vicinity of the proposed Fold-In and Hopkins Transmission Station, but several species could potentially exist, based on rare species locations in Richland County, South Carolina. Based on the USFWS and SCHTP lists, the threatened or endangered species that could **potentially** occur (although no records of their occurrence exist and they were not found in the field investigation) along the Fold-In route and on the Hopkins Transmission Station lot are the following:

| <b>Common Name</b>         | <b>Scientific Name</b>          | <b>Status</b>                       |
|----------------------------|---------------------------------|-------------------------------------|
| Rafinesque's big-eared bat | <i>Corynorhinus rafinesquii</i> | State endangered                    |
| Smooth coneflower          | <i>Echinacea laevigata</i>      | Federal endangered/State endangered |
| Pine Barrens tree frog     | <i>Hyla andersonii</i>          | State threatened                    |
| Bald Eagle                 | <i>Haliaeetus leucocephalus</i> | Federal threatened/State endangered |
| Rough-leaved loosestrife   | <i>Lysimachia asperulifolia</i> | Federal endangered/State endangered |
| Canby's dropwort           | <i>Oxypolis canbyi</i>          | Federal endangered/State endangered |
| Red-cockaded woodpecker    | <i>Picoides borealis</i>        | Federal endangered/State endangered |

- Rafinesque's big-eared bat (*Corynorhinus rafinesquii* - State endangered) is uncommon over its range that includes the southeastern US, west to the Mississippi River and portions of Missouri, Illinois, Indiana, Ohio, West Virginia, and Virginia. Rafinesque's



big-eared bat roosts in small groups or singly, typically using abandon buildings, hollow trees, and bridges (NatureServe 2004). Maternity colonies appear to use abandon buildings (Harvey et al. 1999), while males are typically solitary during the nursing season. Foraging occurs in mature uplands and bottomlands for moths and other night-flying insects (Harvey et al. 1999). The only nearby record of Rafinesque's big-eared bat is at a bridge approximately 3 miles from the proposed project, where a single individual was observed. The area along the Fold-In route includes foraging habitat for this species, but this habitat is plentiful in the area.

- Smooth coneflower (*Echinacea laevigata* – Federal endangered/State endangered) occurs in meadows and woodlands with basic or circumneutral soils (Radford et al. 1983), and is found in Georgia, North Carolina, South Carolina, and Virginia. Prime habitat for smooth coneflower has little competition with herbaceous species and profuse sunlight. Several records of smooth coneflower are from transmission line right-of-way. Open areas in the study area did not support vegetation typically associated (diverse plants community associated with basic soils) with smooth coneflower, and no plants were observed. The closest record for smooth coneflower was approximately 15 miles from the study corridor. If habitat existed in the area, clearing and routine maintenance of the right-of-way for the 230kV Fold-In would only improve habitat for this species.
- Bald Eagle (*Haliaeetus leucocephalus* - Federal threatened/State endangered) is successfully populating large reservoirs and rivers of the Southeast. They are present at nesting sites in January, and young are fledged in May. Short migrations may occur to more southern latitudes in summer and fall when more northern birds migrate through South Carolina. Bald eagles generally prefer to nest in dominant large pines or cypress trees, and generally nest and feed near water (Russo and Sweeney 2000). Suitable feeding sites occur in the project area, primarily in the swamps and canals that occur along the proposed Fold-In route. The closest nest site to the proposed project is approximately 5 miles.
- Pine Barrens tree frog (*Hyla andersonii* – State threatened) is found in Alabama, New Jersey, North Carolina and South Carolina. It is adapted to an interspersed of shrubs and herbaceous bogs or pocosins with adjacent upland oak and pines. Cely and Sorrow (1986) encountered pine barren tree frogs in utility right-of-way and clear cuts; apparently disturbance is necessary to maintain their preferred habitat, as they are intolerant of closed canopies. The closest record for this species is at a seepage bog

approximately 19 miles from the proposed project.

- Rough-leaved loosestrife (*Lysimachia asperulifolia* – Federal endangered/State endangered) is adapted to full sunlight at the edges of pond-pine pocosins on wet to seasonally saturated sand or deep peat soils of Carolina bays; it also has been found in roadside depressions, firebreaks, seeps, and power line right-of-way (Russo and Sweeney 2000). Timber harvests or fire are essential for its survival. The only reported occurrence in South Carolina is approximately 14 miles from the project; all other known populations occur in North Carolina.
- Canby's dropwort (*Oxypolis canbyi* – Federal endangered/State endangered) has been reported from the coastal plain of Delaware (extirpated), Maryland, North Carolina, South Carolina and Georgia. Its habitat includes a variety of inundated habitats, including wet pine savannahs, pond cypress, pineland ponds and grass/sedge Carolina bays that are flooded and have an open canopy; it is important to maintain sufficient sunlight and an adequate water level for this species (NatureServe 2004). It is found approximately 9 miles from the proposed project.
- Red-cockaded woodpecker (*Picoides borealis* – Federal endangered/State endangered) occurs in the southeastern US. It requires open mature pine forests, and apparently prefers longleaf pine, with a sparse understory. Preferred habitat is maintained by periodic controlled burning or wildfires that keep the pine stand in an open "park-like" condition (Russo and Sweeney 2000). The primary habitat in South Carolina occurs in the Coastal Plain on dry uplands in the Sandhills. The red-cockaded woodpecker excavates a cavity in the mature, living pine promoting resin flow that generally protects the cavity from predators. Many of the occurrences of red-cockaded woodpeckers are found on nearby Fort Jackson military base. The closest breeding colony occurs approximately 8 miles from the proposed project, and no habitat for red-cockaded woodpeckers were found in the vicinity of the project during the April 13, 2004 biological investigation.

### **3.5 Other Resources of Note**

No other resources of note were encountered along the route of the Hopkins 230kV Fold-in or on the Hopkins Transmission Substation Site.

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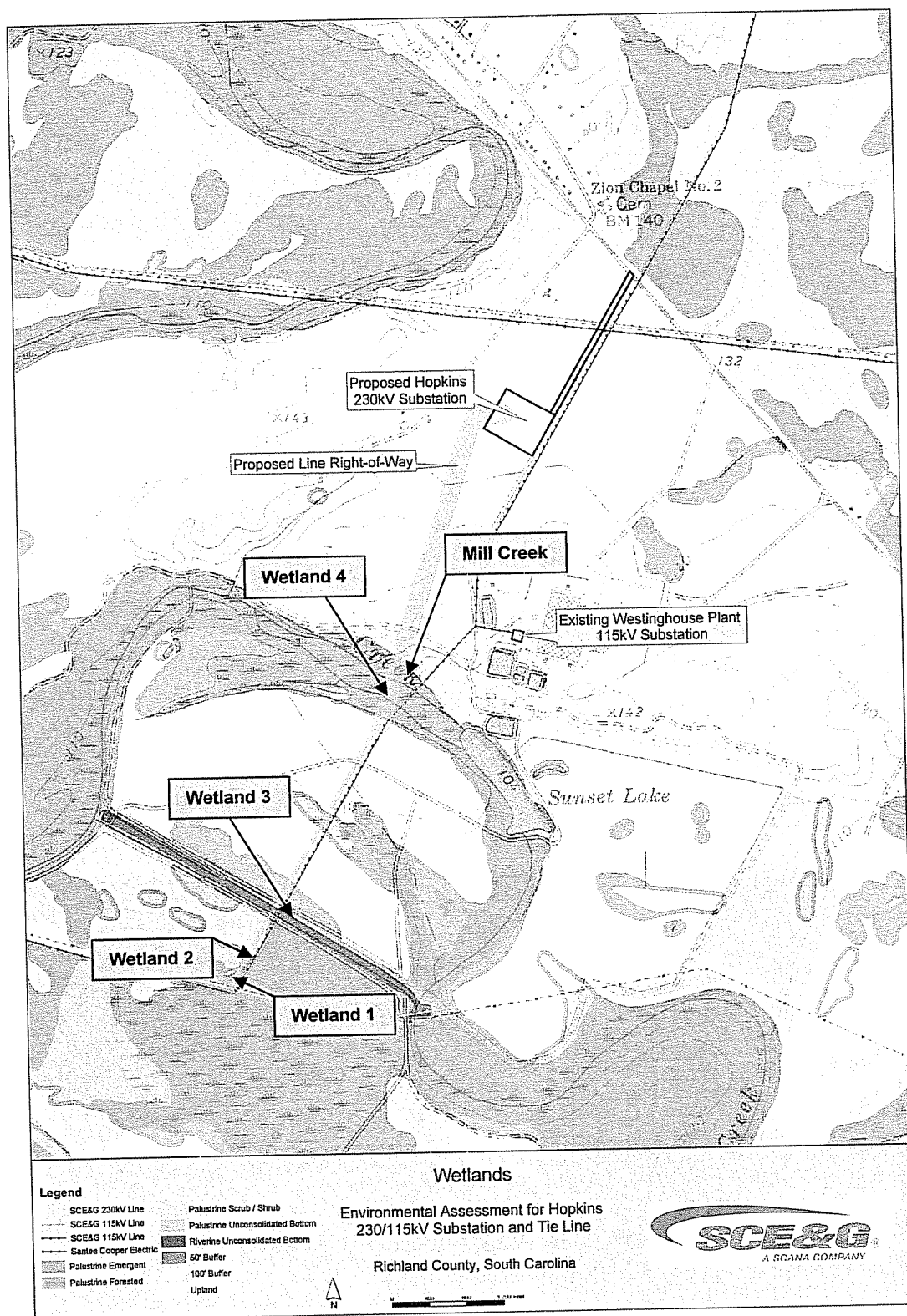
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**Figure 1.** Approximate locations of wetlands identified in field reconnaissance of the proposed Hopkins 230kV Fold-In Line and 230-115kV Transmission Substation.

## *APPENDIX A*

### *WETLANDS DATA 1 FORMS AND PHOTOGRAPHS OF WATERS*

DATA FORM 1  
WETLAND DETERMINATION

Applicant Name: South Carolina Electric & Gas Company.  
Project Name: Hopkins 230kV Fold-In and 230-115kV Transmission Substation  
State: SC County: Richland Date: 4/13/04.  
Section: Fort Jackson South, USGS 7.5-minute map  
Transect and Plot No.: Wetland 1.

**Vegetation**

| <u>Species</u>                 | <u>Indicator status</u> | <u>Species</u>             | <u>Indicator status</u> |
|--------------------------------|-------------------------|----------------------------|-------------------------|
| <b><u>Trees</u></b>            |                         | <b><u>Herbs</u></b>        |                         |
| <i>Acer rubrum</i>             | FAC                     | <i>Corydalis flabula</i>   | FACU                    |
| <i>Liquidambar styraciflua</i> | FAC+                    | <i>Carex</i> spp.          | FAC                     |
| <i>Quercus phellos</i>         | FACW-                   | <i>Viola</i> spp.          | FAC                     |
| <b><u>Saplings/shrubs</u></b>  |                         | <b><u>Woody vines</u></b>  |                         |
| <i>Ilex decidua</i>            | FACW-                   | <i>Bignonia capreolata</i> | FAC                     |
| <i>Acer negundo</i>            | FACW                    | <i>Smilax rotundifolia</i> | FAC                     |
| <i>Asimina triloba</i>         | FAC                     | <i>Campsis radicans</i>    | FAC                     |

% of species that are OBL, FACW, and/or FAC: 92% Other indicators:  
Hydrophytic vegetation: Yes: X No:      Basis: % of FAC and wetter.

**Soil**

Series and phase: Not determined  
Mottled: Yes:      No: X Mottled color:     ; Matrix color:     .  
Gleyed: Yes:      No: X Other indicators: Soils – 10YR6/2 in area surrounding swales; 10YR6/1 at 12" in swales; Oxidized root channels.  
Hydric soils: Yes: X No:      Basis: Chroma less than 2

**Hydrology**

Inundated: Yes:      No: X Depth of standing water: None  
Saturated soils: Yes:      No: X Depth to saturated soil: Not saturated  
Other indicators: None  
Wetland hydrology: Yes:      No: X Basis: Area drained by ditch; hydrology potentially present in swales.  
Atypical situation: Yes: X No:       
Normal Circumstances? Yes:      No: X

**Wetland Determination:** Wetland:      Non-wetland: X (Swales delineated for concurrence with Corps.)

**Comment:** Area drained by several swales and large ditch. Vegetation and soil parameters present, but strong indications that area is drained by ditch. Unvegetated swales to ditch delineated as jurisdictional for check with Corps.

Determined by: Environmental Resources of the Carolinas, 7550 Forest Oak Drive, Denver, NC 28037.  
(704) 483-0972

# DATA FORM 1 WETLAND DETERMINATION

Applicant Name: South Carolina Electric & Gas Company.  
 Project Name: Hopkins 230kV Fold-In and 230-115kV Transmission Substation  
 State: SC County: Richland Date: 4/13/04.  
 Section: Fort Jackson South, USGS 7.5-minute map  
 Transect and Plot No.: Wetland 2.

## Vegetation

| <u>Species</u>                 | <u>Indicator status</u> | <u>Species</u>             | <u>Indicator status</u> |
|--------------------------------|-------------------------|----------------------------|-------------------------|
| <b><u>Trees</u></b>            |                         | <b><u>Herbs</u></b>        |                         |
| <i>Acer rubrum</i>             | FAC                     | <i>Corydalis flabula</i>   | FACU                    |
| <i>Liquidambar styraciflua</i> | FAC+                    | <i>Carex</i> spp.          | FAC                     |
| <i>Quercus phellos</i>         | FACW-                   | <i>Viola</i> spp.          | FAC                     |
| <b><u>Saplings/shrubs</u></b>  |                         | <b><u>Woody vines</u></b>  |                         |
| <i>Ilex decidua</i>            | FACW-                   | <i>Bignonia capreolata</i> | FAC                     |
| <i>Ilex opaca</i>              | FAC-                    | <i>Smilax rotundifolia</i> | FAC                     |
| <i>Asimina triloba</i>         | FAC                     | <i>Campsis radicans</i>    | FAC                     |

% of species that are OBL, FACW, and/or FAC: 83% Other indicators:  
 Hydrophytic vegetation: Yes: X No:     Basis: % of FAC and wetter.

## Soil

Series and phase: Not determined.  
 Mottled: Yes:     No: X Mottled color:    ; Matrix color:    .  
 Gleyed: Yes:     No: X Other indicators: Soils – 10YR6/2 in area surrounding swales;  
10YR6/1 at 12" in swales; Oxidized root channels.  
 Hydric soils: Yes: X No:     Basis: Chroma less than 2.

## Hydrology

Inundated: Yes:     No: X Depth of standing water: None.  
 Saturated soils: Yes:     No: X Depth to saturated soil: Not saturated.  
 Other indicators: None.  
 Wetland hydrology: Yes:     No: X Basis: Area drained by ditch; hydrology potentially  
present in swales.  
 Atypical situation: Yes: X No:    .  
 Normal Circumstances? Yes:     No: X.

**Wetland Determination:** Wetland:     Non-wetland: X (Swales delineated for concurrence with Corps.

**Comment:** Area drained by several swales and large ditch as in Wetland 1. Vegetation and soil parameters present, but strong indications that area is drained by ditch. Swales to ditch delineated as jurisdictional for check with Corps.

Determined by: Environmental Resources of the Carolinas, 7550 Forest Oak Drive, Denver, NC 28037. (704) 483-0972)

# DATA FORM 1 WETLAND DETERMINATION

Applicant Name: South Carolina Electric & Gas Company.  
 Project Name: Hopkins 230kV Fold-In and 230-115kV Transmission Substation  
 State: SC County: Richland Date: 4/13/04  
 Section: Fort Jackson South, USGS 7.5-minute map  
 Transect and Plot No.: Wetland 3.

## Vegetation

| <u>Species</u>                 | <u>Indicator status</u> | <u>Species</u>                | <u>Indicator status</u> |
|--------------------------------|-------------------------|-------------------------------|-------------------------|
| <b><u>Trees</u></b>            |                         | <b><u>Herbs</u></b>           |                         |
| <i>Acer rubrum</i>             | FAC                     | <i>Boehmeria cylindrica</i>   | FACW+                   |
| <i>Liquidambar styraciflua</i> | FAC+                    | <i>Saururus cernuus</i>       | OBL                     |
| <i>Fraxinus pennsylvanica</i>  | FACW                    |                               |                         |
| <b><u>Saplings/shrubs</u></b>  |                         | <b><u>Woody vines</u></b>     |                         |
| <i>Ilex decidua</i>            | FACW-                   | <i>Toxicodendron radicans</i> | FAC                     |
| <i>Ligustrum sinense</i>       | FAC                     | <i>Smilax rotundifolia</i>    | FAC                     |
| <i>Toxicodendron vernix</i>    | OBL                     | <i>Campsis radicans</i>       | FAC                     |

% of species that are OBL, FACW, and/or FAC: 91% Other indicators:  
 Hydrophytic vegetation: Yes: X No:     Basis: % of FAC and wetter.

## Soil

Series and phase: Not determined  
 Mottled: Yes:     No: X Mottled color: 10YR5/1 ; Matrix color: 10YR5/2  
 Gleyed: Yes:     No: X Other indicators: Soils – 10YR6/2 in area surrounding swales; 10YR6/1 at 12" in swales; Oxidized root channels.  
 Hydric soils: Yes: X No:     Basis: Chroma less than 2.

## Hydrology

Inundated: Yes: X No:     Depth of standing water: Undetermined  
 Saturated soils: Yes: X No:     Depth to saturated soil:      
 Other indicators:      
 Wetland hydrology: Yes: X No:     Basis: Inundated and saturated soil.  
 Atypical situation: Yes:     No: X  
 Normal Circumstances? Yes: X No:    

**Wetland Determination:** Wetland: X Non-wetland:      
 Comment: Forested wetlands, with mature hardwoods, bordering drainage canal.

Determined by: Environmental Resources of the Carolinas, 7550 Forest Oak Drive, Denver, NC 28037. (704) 483-0972.



# DATA FORM 1 WETLAND DETERMINATION

Applicant Name: South Carolina Electric & Gas Company.  
 Project Name: Hopkins 230kV Fold-In and 230-115kV Transmission Substation  
 State: SC County: Richland Date: 4/13/04.  
 Section: Fort Jackson South, USGS 7.5-minute map  
 Transect and Plot No.: Wetland 4.

## Vegetation

| <u>Species</u>                | <u>Indicator status</u> | <u>Species</u>             | <u>Indicator status</u> |
|-------------------------------|-------------------------|----------------------------|-------------------------|
| <b><u>Trees</u></b>           |                         | <b><u>Herbs</u></b>        |                         |
| <i>Fraxinus pennsylvanica</i> | FACW                    | <i>Lemna</i> spp.          | OBL                     |
| <i>Nyssa aquatica</i>         | OBL                     | <i>Saururus cernuus</i> .  | OBL                     |
| <i>Quercus michauxii</i>      | FACW-                   | <i>Sagittaria</i> spp.     | OBL                     |
| <b><u>Saplings/shrubs</u></b> |                         | <b><u>Woody vines</u></b>  |                         |
| <i>Toxicodendron vernix</i>   | OBL                     | <i>Bignonia capreolata</i> | FAC                     |
| <i>Itea virginica</i>         | FACW+                   |                            |                         |
|                               |                         |                            |                         |

% of species that are OBL, FACW, and/or FAC: 100% Other indicators:  
 Hydrophytic vegetation: Yes: X No:     Basis: % of FAC and wetter.

## Soil

Series and phase: Not determined  
 Mottled: Yes:     No: X Mottled color:    ; Matrix color:    .  
 Gleyed: Yes:     No: X Other indicators: Soils – 5Y4/1.  
 Hydric soils: Yes: X No:     Basis: Chroma less than 2.

## Hydrology

Inundated: Yes: X No:     Depth of standing water: Undetermined.  
 Saturated soils: Yes: X No:     Depth to saturated soil:    .  
 Other indicators:    .  
 Wetland hydrology: Yes: X No:     Basis: Inundated and saturated soil.  
 Atypical situation: Yes:     No: X.  
 Normal Circumstances? Yes: X No:    .

**Wetland Determination:** Wetland: X Non-wetland:    .

Comment: Forested wetlands, with mature hardwoods. Boundary on north side of Wetland 4 is adjacent to bottomland. The bottomland was determined non-wetland because soils are sandy and show little signs of reduction.

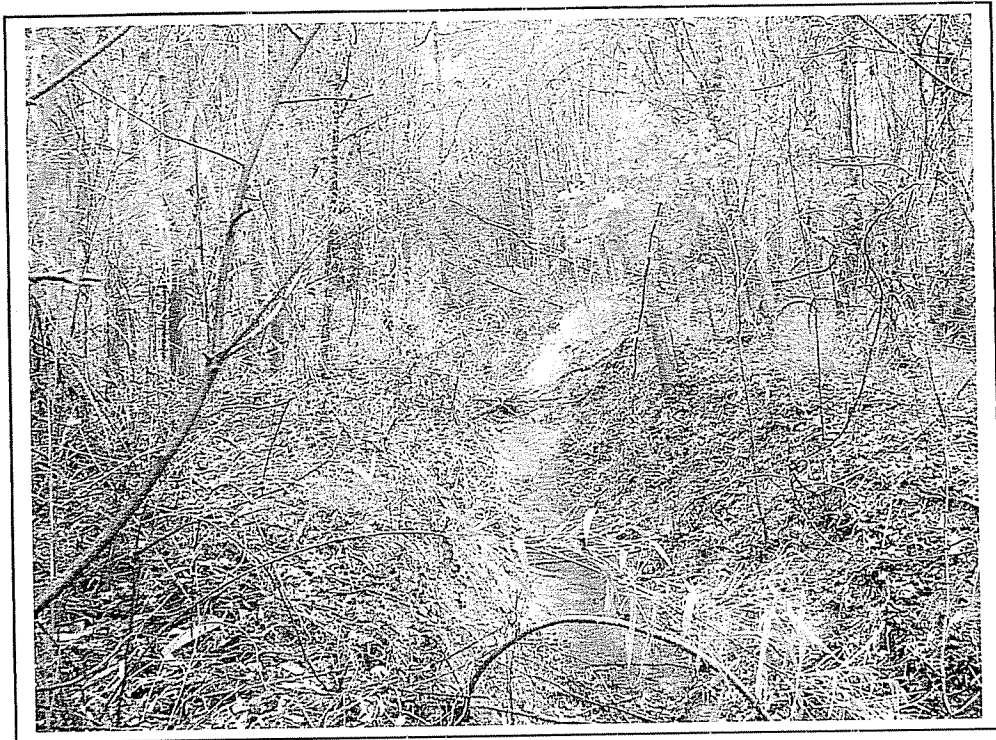
Determined by: Environmental Resources of the Carolinas, 7550 Forest Oak Drive, Denver, NC 28037. (704) 483-0972.



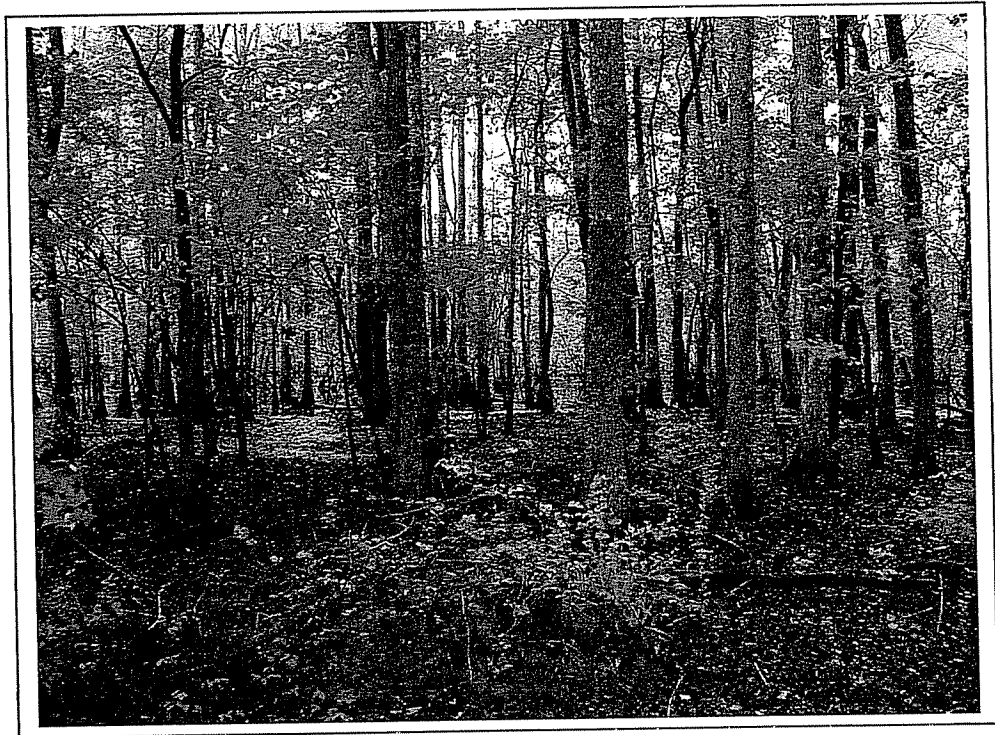
*Wetland 1 on the proposed Hopkins 230kV Fold-In study corridor, showing a sparsely vegetated swale, as observed on April 13, 2004.*



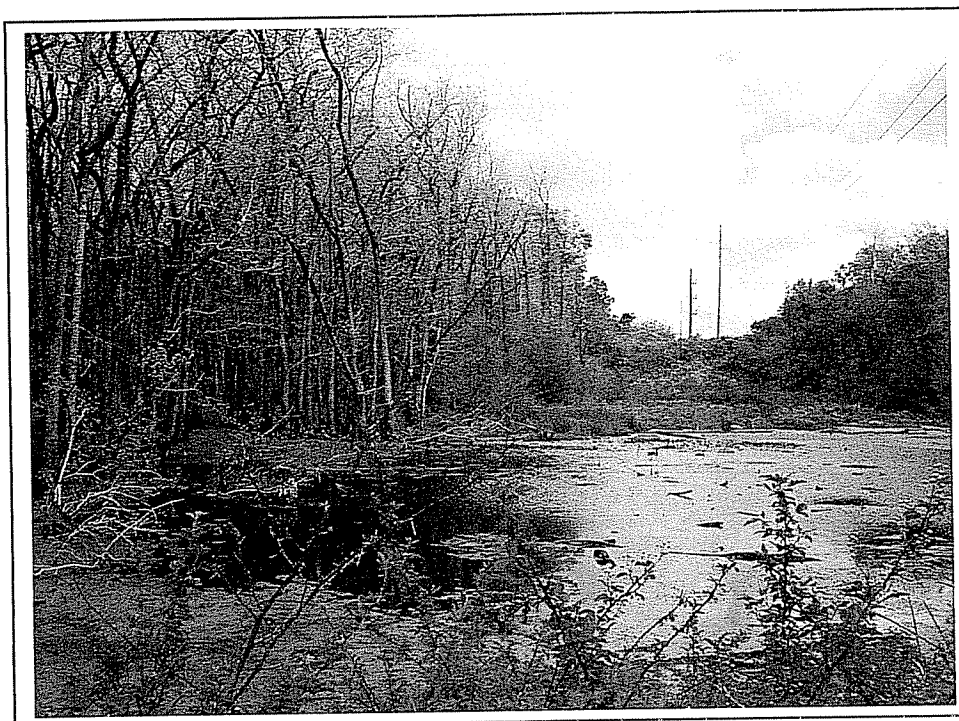
*Wetland 2 in the proposed Hopkins 230kV Fold-In study corridor as observed on April 13, 2004.*



*Drainage ditch that drains the area of Wetlands 1 and 2, in the study corridor of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*



*Wetland 3, an inundated forested wetland, in the proposed Hopkins 230kV Fold-In study corridor, as observed on April 13, 2004.*

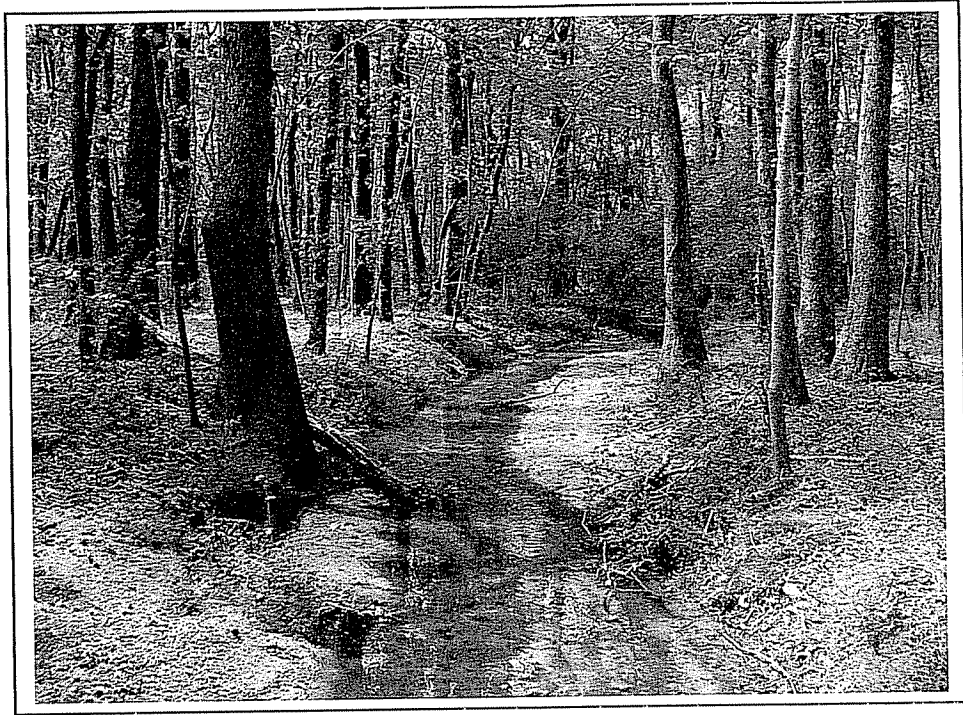


*Wetland 4 in the study corridor of the Hopkins 230kV Fold-In,  
as viewed from the south on April 13, 2004.  
Wetland 4 is crossed by the existing Westinghouse 115kV Line.*



*Photograph of a drainage canal in the study corridor of the  
proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*





*Photograph of Mill Creek in the study corridor  
of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*



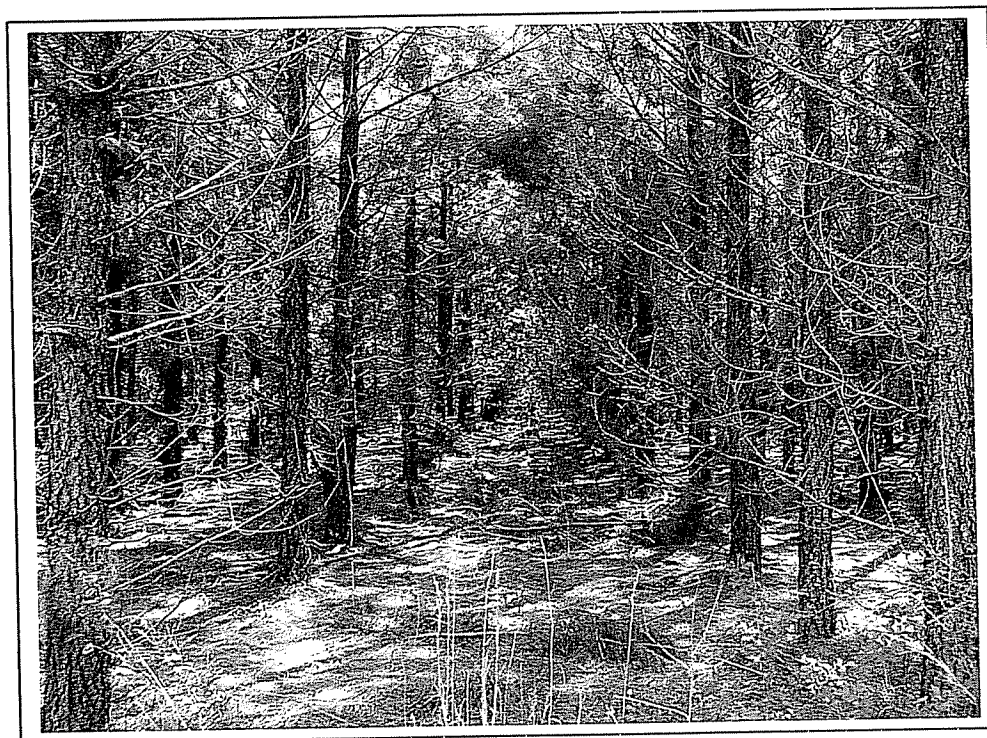
*Photograph of a dry drainage ditch in the study corridor  
of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*

## *APPENDIX B*

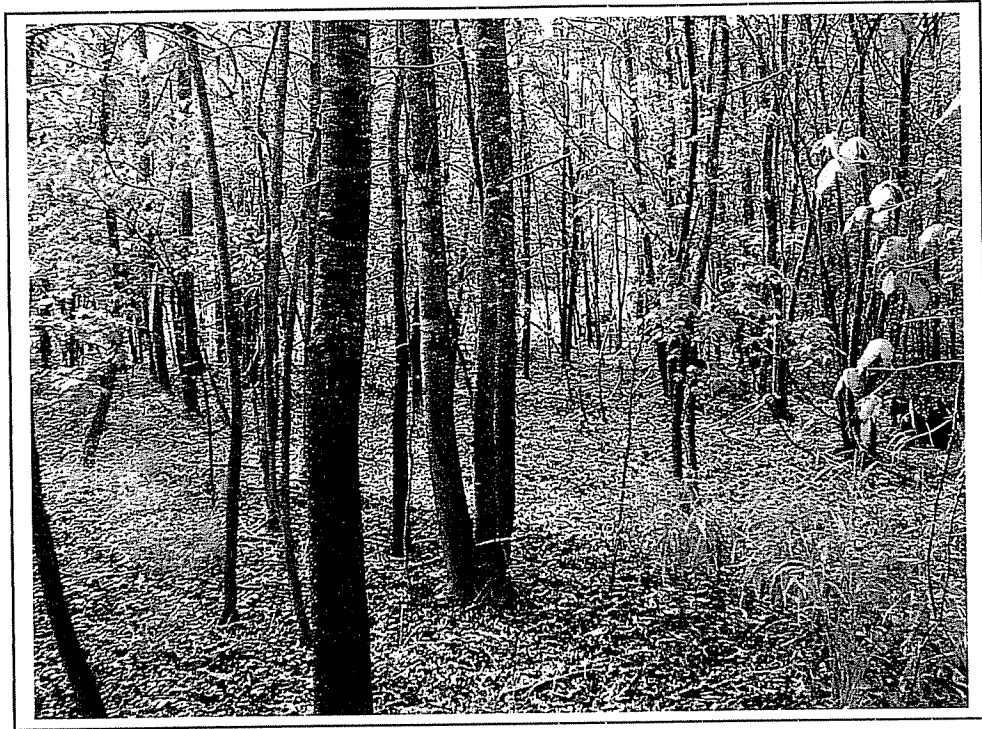
### *PHOTOGRAPHS OF VEGETATIVE COMMUNITIES*



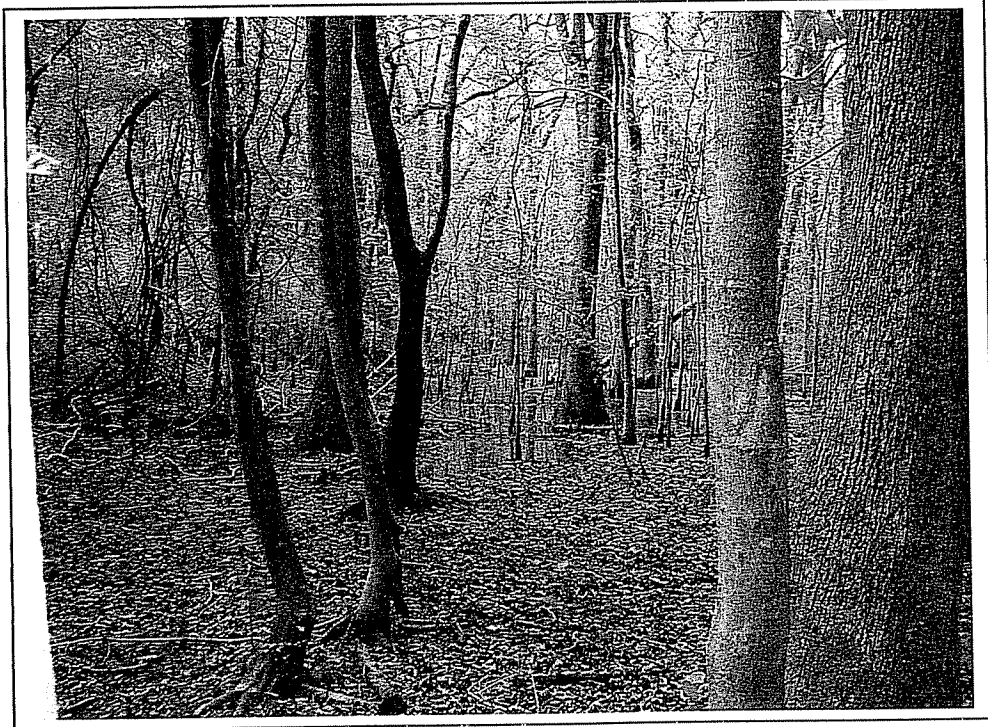
*Photograph of a pine plantation adjacent to early succession opening in the study corridor for the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*



*Photo of a pine plantation in the study corridor for the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*



*Photograph of bottomland hardwoods near Wetland 2 in the study corridor of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*

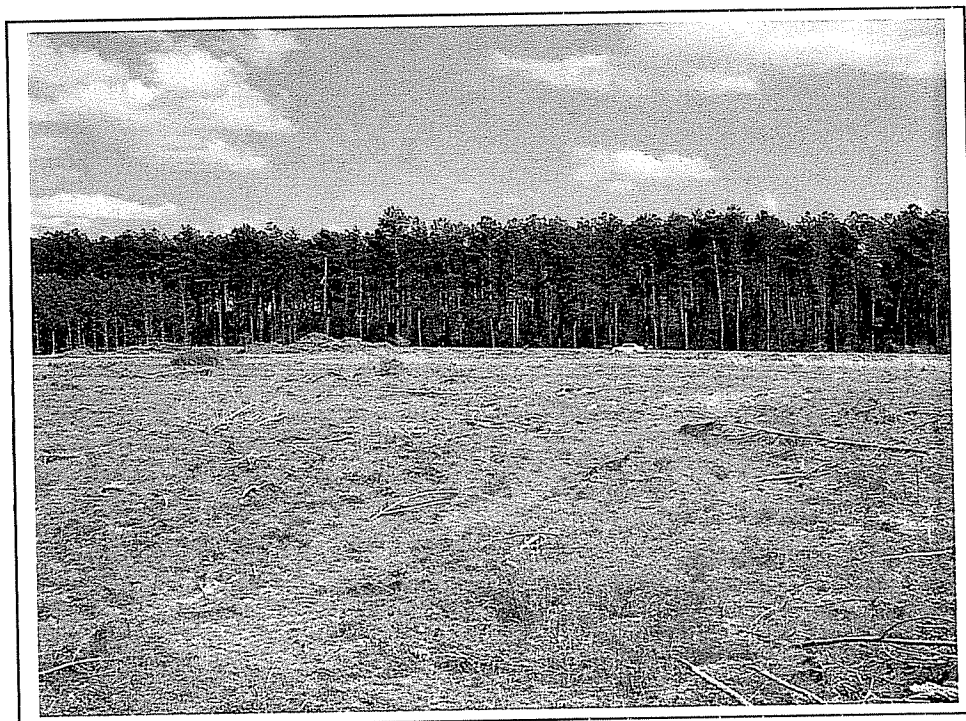


*Photograph of forested wetlands in the study corridor of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*





*Photograph of an agricultural field in the study corridor of the proposed Hopkins 230kV Fold-In, as observed on April 13, 2004.*



*Photograph of the proposed Hopkins 230-115kV Transmission Substation site, as observed on April 13, 2004.*

*APPENDIX C*

*SOUTH CAROLINA RARE, THREATENED, AND ENDANGERED  
SPECIES INVENTORY FOR  
RICHLAND COUNTY, SOUTH CAROLINA*

SOUTH CAROLINA RARE, THREATENED, AND ENDANGERED SPECIES  
INVENTORY FOR RICHLAND COUNTY, SOUTH CAROLINA  
UPDATED JUNE 9, 2003

| SCIENTIFIC NAME          | COMMON NAME                | LEGAL STATUS |
|--------------------------|----------------------------|--------------|
| AGALINIS TENELLA         | GERARDIA                   | SC           |
| ANDROPOGON PERANGUSTATUS | NARROW LEAVED BLUESTEM     | SC           |
| ARISTIDA CONDENSATA      | PIEDMONT THREE-AWNED GRASS | SC           |
| ASTER ELLIOTTII          | ELLIOTT'S ASTER            | SC           |
| ASTRAGALUS MICHAUXII     | SANDHILLS MILKVETCH        | SC           |
| BALDUINA ATROPURPUREA    | PURPLE BALDUINA            | SC           |
| BOTRYCHIUM LUNARIOIDES   | WINTER GRAPE-FERN          | SC           |
| CALAMOVILFA BREVIPILIS   | PINE-BARRENS REED-GRASS    | NC           |
| CAREX CHEROKEENSIS       | CHEROKEE SEDGE             | SC           |
| CAREX COLLINSII          | COLLINS' SEDGE             | SC           |
| CAREX CRUS-CORVI         | RAVENFOOT SEDGE            | SC           |
| CAREX ELLIOTTII          | ELLIOTT'S SEDGE            | SC           |
| CAREX SOCIALIS           | SOCIAL SEDGE               | SC           |
| CAROLINA BAY             | WETLAND                    | SC           |
| CAYAPONIA BOYKINII       | CAYAPONIA                  | SC           |
| COLLINSONIA SEROTINA     | SOUTHERN HORSE-BALM        | SC           |
| COLONIAL WATERBIRD       | ROOKERY                    | SC           |
| CONDYLURA CRISTATA       | STAR-NOSED MOLE            | SC           |
| COREOPSIS GLADIATA       | SOUTHEASTERN TICKSEED      | SC           |
| CORYNORHINUS RAFINESQUII | RAFINESQUE'S BIG-EARED BAT | SE           |
| DRYOPTERIS CARTHUSIANA   | SPINULOSE SHIELD FERN      | SC           |
| ECHINACEA LAEVIGATA      | SMOOTH CONEFLOWER          | FE/SE        |
| ELEOCHARIS ROBBINSII     | ROBBINS SPIKERUSH          | SC           |
| ELIMIA CATENARIA         | GRAVEL ELIMIA              | SC           |
| ETHEOSTOMA COLLIS        | CAROLINA DARTER            | SC           |
| FUNDULUS DIAPHANUS       | BANDED KILLIFISH           | SC           |
| HALIAEETUS LEUCOCEPHALUS | BALD EAGLE                 | FT/SE        |
| HETERODON SIMUS          | SOUTHERN HOGNOSE SNAKE     | SC           |
| HYLA ANDERSONII          | PINE BARRENS TREEFROG      | ST           |
| HYMENOCALLIS CORONARIA   | SHOALS SPIDER-LILY         | NC           |
| HYPERICUM ADPRESSUM      | CREEPING ST. JOHN'S-WORT   | RC           |

| SCIENTIFIC NAME              | COMMON NAME              | LEGAL STATUS |
|------------------------------|--------------------------|--------------|
| HYPERICUM NITIDUM            | CAROLINA ST. JOHN'S-WORT | SC           |
| ILEX AMELANCHIER             | SARVIS HOLLY             | SC           |
| IPOMOPSIS RUBRA              | RED STANDING-CYPRESS     | SC           |
| JUNCUS ABORTIVUS             | PINEBARREN RUSH          | SC           |
| LECHEA TORREYI               | PIEDMONT PINWEED         | SC           |
| LIATRIS MICROCEPHALA         | SMALL-HEAD GAYFEATHER    | SC           |
| LINDERA SUBCORIACEA          | BOG SPICEBUSH            | RC           |
| LOBELIA SP 1                 | LOBELIA                  | SC           |
| LUDWIGIA SPATHULATA          | SPATULATE SEEDBOX        | SC           |
| LYCOPUS COKERI               | CAROLINA BUGLEWEED       | SC           |
| LYSIMACHIA ASPERULIFOLIA     | ROUGH-LEAVED LOOSESTRIFE | FE/SE        |
| MACBRIDEA CAROLINIANA        | CAROLINA BIRD-IN-A-NEST  | SC           |
| MAGNOLIA MACROPHYLLA         | BIGLEAF MAGNOLIA         | SC           |
| MAGNOLIA PYRAMIDATA          | PYRAMID MAGNOLIA         | RC           |
| MYRIOPHYLLUM LAXUM           | PIEDMONT WATER-MILFOIL   | RC           |
| NESTRONIA UMBELLULA          | NESTRONIA                | SC           |
| NOTROPIS CHILITICUS          | REDLIP SHINER            | SC           |
| OPHIOGLOSSUM VULGATUM        | ADDER'S-TONGUE           | SC           |
| OXYPOLIS CANBYI              | CANBY'S DROPWORT         | FE/SE        |
| PASPALUM BIFIDUM             | BEAD-GRASS               | SC           |
| PICOIDES BOREALIS            | RED-COCKADED WOODPECKER  | FE/SE        |
| PITYOPSIS PINIFOLIA          | PINE-LEAVED GOLDEN ASTER | SC           |
| PLAGIOCHILA SULLIVANTII      | LIVERWORT                | SC           |
| POTAMOGETON<br>CONFEROIDES   | ALGAE-LIKE PONDWEED      | SC           |
| PRUNUS ALABAMENSIS           | ALABAMA BLACK CHERRY     | SC           |
| PSILOTUM NUDUM               | WHISK FERN               | SC           |
| PTEROGLOSSASPIS<br>ECRISTATA | CRESTLESS PLUME ORCHID   | SC           |
| RHEXIA ARISTOSA              | AWNED MEADOWBEAUTY       | SC           |
| RHINICHTHYS ATRATULUS        | BLACKNOSE DACE           | SC           |
| RHODODENDRON EASTMANII       | MAY WHITE                | SC           |
| RHYNCHOSPORA INUNDATA        | DROWNED HORNEDRUSH       | SC           |
| RHYNCHOSPORA MACRA           | BEAK RUSH                | SC           |
| RHYNCHOSPORA OLIGANTHA       | FEW-FLOWERED BEAKED-RUSH | SC           |
| RHYNCHOSPORA PALLIDA         | PALE BEAKRUSH            | SC           |
| RHYNCHOSPORA<br>STENOPHYLLA  | CHAPMAN BEAKRUSH         | SC           |

| SCIENTIFIC NAME                            | COMMON NAME              | LEGAL STATUS |
|--|--------------------------|--------------|
| SARRACENIA RUBRA                           | SWEET PITCHER-PLANT      | SC           |
| SCIRPUS ETUBERCULATUS                      | CANBY BULRUSH            | SC           |
| SCIURUS NIGER                              | EASTERN FOX SQUIRREL     | SC           |
| SPILOGALE PUTORIUS                         | EASTERN SPOTTED SKUNK    | SC           |
| STROPHITUS UNDULATUS                       | SQUAWFOOT                | SC           |
| SYLVILAGUS AQUATICUS                       | SWAMP RABBIT             | SC           |
| TOFIELDIA GLABRA                           | WHITE FALSE-ASPHODEL     | SC           |
| TREPOCARPUS AETHUSAE                       | AETHUSA-LIKE TREPOCARPUS | SC           |
| TRIDENS CHAPMANII                          | CHAPMAN'S REDTOP         | SC           |
| TYTO ALBA                                  | BARN-OWL                 | SC           |
| URSUS AMERICANUS                           | BLACK BEAR               | SC           |
| URTICA CHAMAEDRYOIDES                      | WEAK NETTLE              | SC           |
| VACCINIUM CRASSIFOLIUM<br>SSP SEMPERVIRENS | RAYNER'S BLUEBERRY       | NC           |
| VILLOSA DELUMBIS                           | EASTERN CREEKSHELL       | SC           |
| WAREA CUNEIFOLIA                           | NUTTALL WAREA            | SC           |

**STATUS - legal status:**

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**FE** - Federal Endangered

**FT** - Federal Threatened

**NC** - Of Concern, National (unofficial - plants only)

**RC** - Of Concern, Regional (unofficial - plants only)

**SE** - State Endangered (official state list - animals only)

**ST** - State Threatened (official state list - animals only)

**SC** - Of Concern, State

## APPENDIX C

### CULTURAL RESOURCES SURVEY REPORT

# **Archaeological Survey of the Hopkins Transmission Line Corridor and Substation Tract, Richland County, South Carolina**

by Dawn Reid  
Archaeological Consultants of the Carolinas, Inc.  
2004

## **Introduction**

The Hopkins project area consists of a 3.2 hectare (8 acre) tract and a 2.1 km (1.3 mile) corridor on Westinghouse Electric Corporation property in southern Richland County. South Carolina Electric and Gas (SCE&G) plan to build a 230/115 kV transmission line and substation at these locations. The proposed substation tract is situated adjacent to an unpaved road approximately 550 meters (1,804 ft) south/southwest of Highway 48. The corridor extends southwest from the substation tract, crossing Mill Creek and terminating at an existing transmission line. Figure 1 shows the project areas.

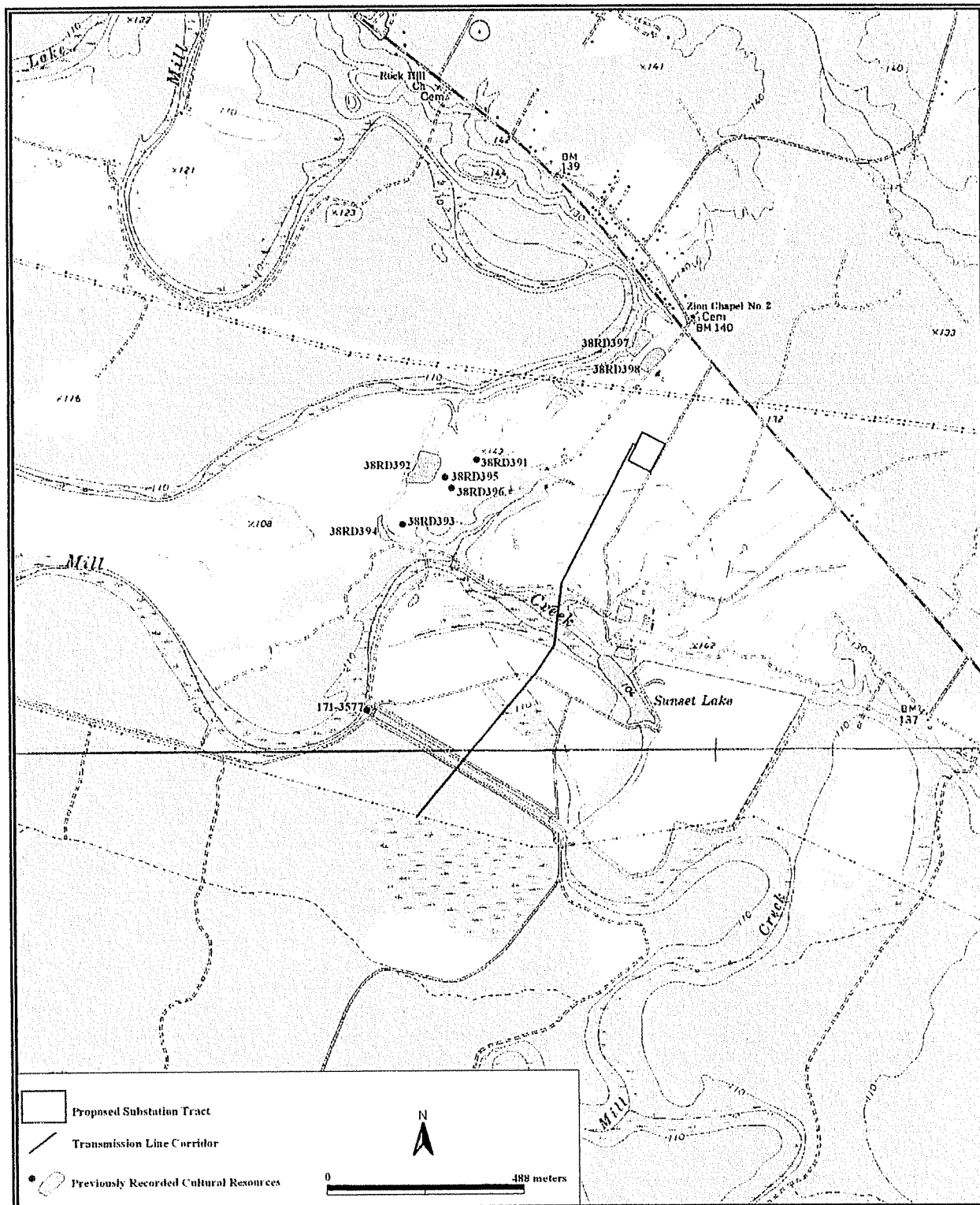
This survey was conducted in compliance with state and federal permit regulations addressing the identification and management of significant cultural resources. These regulations include Section 104 of the Clean Water Act of 1994 (33 USC 1344), as amended; Section 106 of the National Historic Preservation Act of 1966 (16 USC 470), as amended and administered by the regulatory programs of the U.S. Army Corps of Engineers (33 CFR 325); and 36 CFR Part 800: Protection of Historic Properties. For this project, consideration of impacts on cultural resource is also required under a variety of public utility regulations.

## **Investigative Methods**

The goal of this investigation was to identify and evaluate the significance of all cultural resources within and in the vicinity of the project area. This evaluation includes ascertaining the potential impacts of the proposed construction on these resources. Investigation procedures included background research and archaeological survey. The methods utilized for these tasks are discussed below.

### *Background Research*

The South Carolina archaeological site files, located at the South Carolina Institute of Archaeology and Anthropology (SCIAA) in Columbia, were checked for previously recorded archaeological sites within 1.6 km (1.0 mile) of the survey areas. The files concerning previously recorded architectural resources in Anderson County, located at the South Carolina Department of Archives and History (SCDAH) in Columbia, were also examined. These files are repositories for



**Figure 1.** Map showing the survey areas and previously recorded cultural resources in the project vicinity (Fort Jackson South, SC and Saylor's Lake, SC USGS 7.5 topographic quadrangles).



historical documents and reports, including previously conducted architectural resources surveys of most counties in South Carolina. Historic maps of the project area were also examined. Resources on file at the Cooper and South Caroliniana Libraries at the University of South Carolina in Columbia were also examined.

### *Archaeological Field Survey*

Field survey methods complied with the *Survey Manual: South Carolina Statewide Survey of Historic Places* (South Carolina Department of Archives and History [SCDAH] 1990) and were comprised of pedestrian coverage of the project areas. Parallel transects were conducted at 30 meter (98 ft) intervals in the substation tract. Shovel tests were excavated every 30 meters (98 ft). A single transect was conducted along the transmission line corridor centerline. Shovel tests were also excavated at 30 meter (98 ft) intervals along this transect. The corridor centerline has not yet been defined in the central portion of the corridor. Three parallel transects were conducted in this portion of the corridor to insure an investigative coverage of 90 meters (~300 ft).

Shovel tests measured approximately 30 cm (12 in) in diameter and were excavated into sterile subsoil (i.e., reddish brown or orange clay). Fill from the shovel tests was screened through 1/4 inch hardware cloth. Records of each shovel test were kept in field notebooks, including information on content (e.g., presence or absence of artifacts, artifact descriptions) and context (i.e., soils color and texture descriptions, depth of definable levels, observed features). All excavations were backfilled on completion. Shovel test excavation was supplemented by comprehensive examination of all exposed ground surface.

For this project, an archaeological site was defined as an area containing three or more artifacts of a possible single occupation in a 30 meter (98 ft) or less diameter of surface exposure; or where at least two shovel tests within 30 meters (98 ft) are positive (containing one or more artifacts); or where surface or subsurface cultural features are present. Artifacts of recent age (less than 50 years) would typically not define a site without a compelling research or management justification.

### *Laboratory Analysis and Curation*

Had artifacts been recovered during this investigation, they would have been washed, cataloged, and analyzed. Individual provenience numbers would have been assigned to each surface scatter and/or shovel test. Artifacts from each provenience would then be divided by class/type, and assigned a catalog number. For each artifact, raw material, morphology, decoration, and other distinctive characteristics would have been documented.

Upon completion of the final report of this investigation, project maps, field notes, and photographs will be packaged per Department of Interior criteria for permanent curation. This criteria, 36 CFR 79 (Curation of Federally-Owned and Administered Archeological Collections:

Final Rule), includes the use of archivally stable artifact bags, boxes, and labeling material. This artifact assemblage will be submitted to SCIAA for permanent curation.

## **Environmental and Cultural Context**

Human adaptation in South Carolina has changed through time, as both the natural and cultural settings have evolved. The natural environment, technological development, and ideological values are all intertwined in shaping the way humans live. A brief discussion of the environmental and cultural settings in the project area follows.

### *Environmental Setting*

The project area is situated between two physiographic regions - the Inner Coastal Plain and the Piedmont. This interface is referred to as the Fall Line. The Fall Line is characterized by geologic formations of unconsolidated marine deposits (Kovacik and Winberry 1987:18). Elevations in the project area range from 33 to 43 meters (100 to 140 ft) above mean sea level. The rivers, streams, and creeks in this portion of South Carolina are part of the Congaree River drainage system that has a generally southeastward flow. The project corridor crosses Mill Creek, which flows south into the Congaree River.

There are a variety of soil types present in the survey areas. The substation tract contains Persanti very fine sandy loam. This soil is characterized by brown very fine sandy loam overlaying yellowish brown sandy clay loam (Lawrence 1978). The survey corridor contains Congaree loam in the vicinity of Mill Creek. Congaree loam is described by Lawrence (1978) as well drained dark brown loam. South of Mill Creek, the survey corridor crosses through Tawcaw silty clay loam. Tawcaw soils are defined as dark brown silty clay loam grading to reddish brown silty clay and are poorly drained (Lawrence 1978).

Much of the survey areas have undergone long term logging. Planted pine is the prevalent vegetation along the survey corridor (Figure 2). These pines appear to be 10 to 15 years old. Dense briars are present throughout much of the corridor. The substation tract had been cleared of trees, but is surrounded by planted pine (Figure 3). A well-developed cypress swamp surrounds Mill Creek (Figure 4).

### *Cultural Background*

Humans have inhabited the Southeast for more than 12,000 years. This time frame has been broken down into distinct temporal units, based on archaeological and historic data. Familiarity with this history helps us to put a project area and its resources into a cultural context. The cultural chronology for the South Carolina Midlands is discussed in detail in numerous sources, including



**Figure 2.** View of planted pines along the survey corridor, looking south.



**Figure 3.** View of the substation tract, looking northwest.

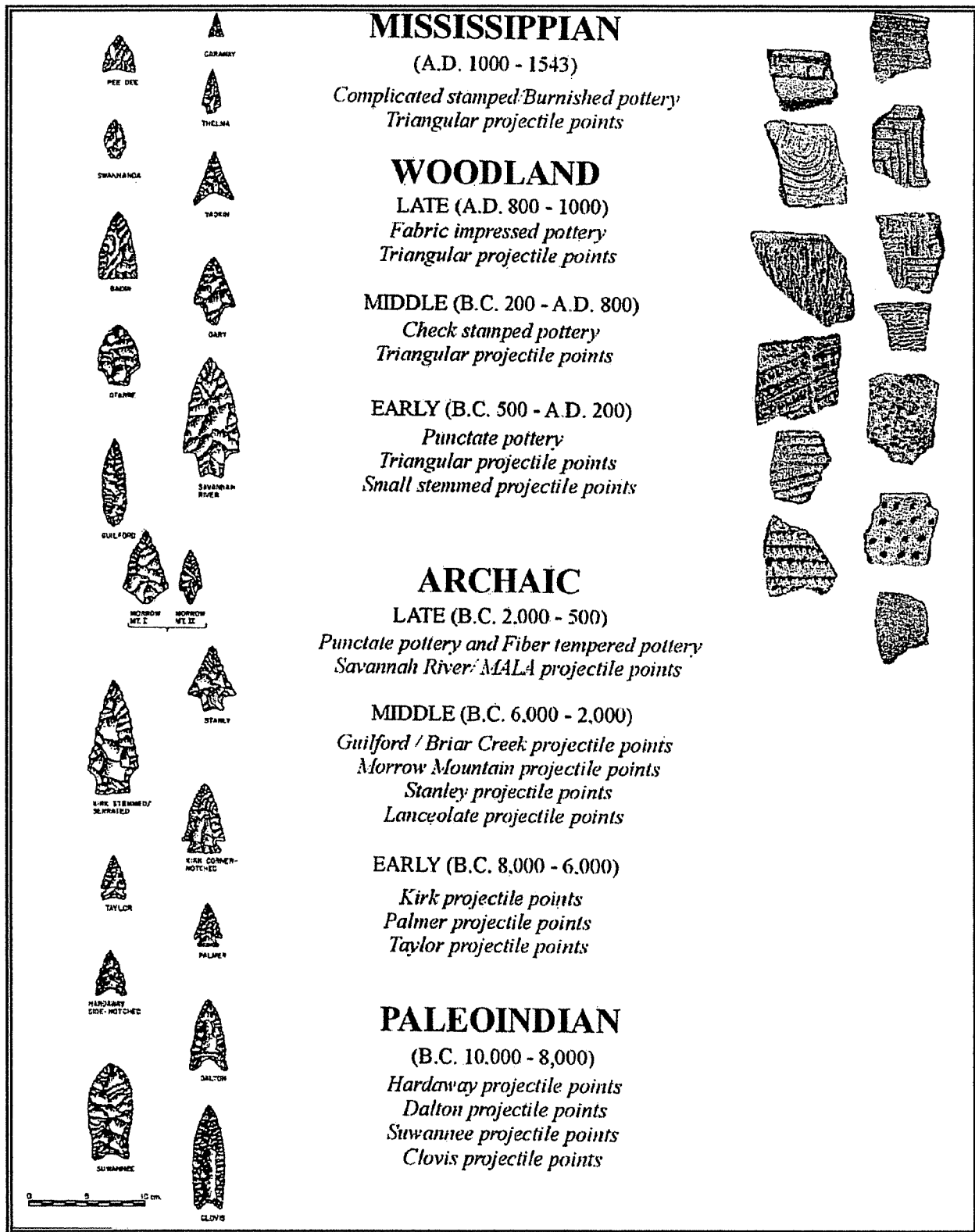


**Figure 4.** View of Mill Creek swamp, looking north.

Southerlin et al. (2002). The reader is also directed to Mark Groover's (1991) Master's thesis that focuses on archaeology on Mill Creek in the project vicinity. Figure 5 presents a summary of the Native American occupation in the project area. A brief discussion of the historic settlement in the project vicinity is presented below.

The first known Europeans to come to South Carolina were Spanish Captains Francisco Gordillo and Pedro de Quexos and their crews who landed in the Port Royal area in the summer of 1521 (Quattlebaum 1956). In 1543, DeSoto led his expedition into the interior of South Carolina. European settlements began to spread along the coast and the major rivers during the seventeenth century. Trading relationships were established between the settlers and the Native Americans and trading posts began to spring up. By 1700, the trading post at the Congarees, south of Columbia, was well established. This trading post was the furthest inland that boat traffic could travel (Bryan 1992).

In 1715, the Native Americans throughout the colony attacked European settlers. This conflict, known as the Yemassee War, failed to dislodge the English from the area (Covington 1968). In 1730, the central portion of South Carolina was divided into 11 districts. The initially named Congaree District was dubbed Saxe Gotha in 1733. The township of Saxe Gotha was situated on the eastern bank of the Congaree River, near what is now the city of Cayce. During this period, the project area contained both large plantations and small family farms. The project corridor cuts through parcels that were owned by J. Rogers and P. Raiford (Meriwether 1940). Both



**Figure 5.** Native American cultural sequence for the South Carolina Midlands (adapted from Stephenson and Pinson [1980] and Steen et al. [1995]).

parcels bordered Mill Creek, which was called Raifords Creek at that time. In the 1760s, the colony was divided into judicial districts. The project area was located in the Richland District.

Population in the project vicinity continued to grow throughout the eighteenth century. Significant Revolutionary battles took place north of our project area, including the defeat of the American forces at Camden in August of 1780 (Edgar 1998). During the war, much of the area's farmland had been ravaged. Farming and ranching quickly recovered, and tobacco began to rise in importance in addition to the flourishing cotton trade.

The city of Columbia was established in the middle 1780s and population in the area continued to grow steadily until about 1830. Farming of grain and vegetable crops had been "neglected for the culture of cotton" (Mills 1979) and the soils were soon depleted. By the middle 1800s, emigration of farmers to more fertile lands in neighboring states was rampant (Kovacik and Winberry 1989).

The Columbia area was a hub of troop and supply movement during the Civil War. The area became a haven for refugees and the area's population grew threefold (Jones 1971). Social, political, and economic upheaval followed the Civil War. The labor systems changed drastically, and settlement shifted from nucleated plantation systems to a widely dispersed pattern of tenant farms and small family farms.

During the early twentieth century, the number of farms in Richland County decreased significantly. Farm size also decreased. The opening of Fort Jackson in 1917 and the growth of the city of Columbia offered non-agricultural employment opportunities. The family farm gave way to suburbs, shopping centers, and industrial/commercial facilities.

## **Investigation Results**

### *Background Research.*

Background research identified nine previously recorded cultural resources in the immediate vicinity of the project area. These resources are reflected on Figure 1. These resources are summarized in Table 1.

The eight archaeological sites recorded along Mill Creek near the project area were all documented by Mark Groover, who investigated the area and excavated the Thomas Howell Plantation for his thesis research. These sites are primarily nineteenth century artifact scatters that Groover describes as home sites. As his survey of the area was only comprised of surface examination, he recommended that additional work be conducted at each of the sites but made the comment that the sites were likely destroyed by deep plowing and/or cultivation. The Thomas Howell Plantation, 38RD397, is a circa 1740s plantation. Thomas Howell was one of the earliest settlers in the project vicinity (Groover 1991). Groover's excavations at this site identified several structures and yielded numerous diagnostic artifacts and preserved bone.

**Table 1.** Previously Recorded Cultural Resources in the Project Vicinity.

| <b>Resource Number</b> | <b>Resource Description</b>  | <b>NRHP Eligibility</b>   |
|------------------------|--|---|
| 38RD391                | middle to late 19 <sup>th</sup> century artifact scatter/tenant farm site                  | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD392                | Archaic/Woodland artifact scatter/middle to late 19 <sup>th</sup> century artifact scatter | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD393                | Middle Archaic/Woodland lithic scatter/early 19 <sup>th</sup> century artifact scatter     | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD394                | historic artifact scatter  | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD395                | middle to late 19 <sup>th</sup> century artifact scatter                                   | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD396                | 19 <sup>th</sup> century artifact scatter  | additional investigation recommended but site form includes comment that site is likely destroyed |
| 38RD397                | Thomas Howell Plantation, c. 1740  | Eligible, data recovery conducted   |
| 38RD398                | middle 19 <sup>th</sup> through 20 <sup>th</sup> century artifact scatter                  | additional investigation recommended but site form includes comment that site is likely destroyed |
| 171-3577               | excavated canal - historic   | recommended potentially eligible  |

The survey corridor crosses resource 171-3577, which is an excavated canal linking two portions of Mill Creek. This canal was believed to be a transportation feature and was recommended potentially eligible for the National Register of Historic Places (NRHP) when it was recorded. However, Mr. Robert Ferres, the SCE&G project manager for the Westinghouse Plant property, stated that this canal was excavated in the 1960s by the Burnside family (property owners) to alleviate flooding in the creek vicinity and improve conditions for hunting as they leased out the area as a hunt club. Although this resource may have some research value as an engineering feature for future researchers, it does not currently meet NRHP eligibility criteria.

### *Field Investigation Results*

As noted above, the substation tract had been cleared of trees. Although slightly overgrown, the tract had good surface visibility and all exposed ground surface was examined. Five parallel transects were conducted in the tract and shovel tests were excavated at 30 meter (98 ft) intervals. Twenty-seven shovel tests were excavated in the substation tract. These tests exhibited mottled light gray, brown, and yellow silt. The tract soils appear to have been severely disturbed by the logging activity. No artifacts or cultural material was observed or collected.

A total of 63 shovel tests was excavated along the proposed transmission line corridor. These tests were excavated along one central transect and two supplemental transects that were conducted in the central portion of the corridor only. Soils varied along the survey corridor. Tests excavated near the northern end of the corridor were comprised of grayish brown silty loam grading to mottled yellowish brown silt and orangish brown clay. This area is planted pine and exhibits disturbance due to logging activities, such as mounded rows and churned up soil. In the vicinity of Mill Creek, shovel tests exposed reddish brown clay loam. Much of the southern end of the corridor is low and wet. Soil in this area consisted of brown clay loam overlaying orange clay. No cultural material was recovered during survey of this corridor.

### **Conclusions and Recommendations**

This investigation has resulted in the comprehensive examination of SCE&G's proposed Hopkins substation and 230/115 kV transmission line. No cultural resources were identified during this investigation. One previously recorded cultural resource, 171-3577, is a canal that was excavated in the 1960s and is not considered to be a significant resource at this time. The crossing of this canal by the transmission line will not adversely impact it. No significant cultural resources will be affected by the proposed construction and clearance is recommended.



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APPENDIX D

SC RARE, THREATENED, AND ENDANGERED SPECIES INVENTORY  
FOR RICHLAND COUNTY, SOUTH CAROLINA

# SC RARE, THREATENED, AND ENDANGERED SPECIES INVENTORY FOR RICHLAND COUNTY, SOUTH CAROLINA

Updated June 9, 2003

| SCIENTIFIC NAME          | COMMON NAME                | LEGAL STATUS |
|--------------------------|----------------------------|--------------|
| AGALINIS TENELLA         | GERARDIA                   | SC           |
| ANDROPOGON PERANGUSTATUS | NARROW LEAVED BLUESTEM     | SC           |
| ARISTIDA CONDENSATA      | PIEDMONT THREE-AWNED GRASS | SC           |
| ASTER ELLIOTTII          | ELLIOTT'S ASTER            | SC           |
| ASTRAGALUS MICHAUXII     | SANDHILLS MILKVETCH        | SC           |
| BALDUINA ATROPURPUREA    | PURPLE BALDUINA            | SC           |
| BOTRYCHIUM LUNARIOIDES   | WINTER GRAPE-FERN          | SC           |
| CALAMOVILFA BREVIPILIS   | PINE-BARRENS REED-GRASS    | NC           |
| CAREX CHEROKEENSIS       | CHEROKEE SEDGE             | SC           |
| CAREX COLLINSII          | COLLINS' SEDGE             | SC           |
| CAREX CRUS-CORVI         | RAVENFOOT SEDGE            | SC           |
| CAREX ELLIOTTII          | ELLIOTT'S SEDGE            | SC           |
| CAREX SOCIALIS           | SOCIAL SEDGE               | SC           |
| CAROLINA BAY             | WETLAND                    | SC           |
| CAYAPONIA BOYKINII       | CAYAPONIA                  | SC           |
| COLLINSONIA SEROTINA     | SOUTHERN HORSE-BALM        | SC           |
| COLONIAL WATERBIRD       | ROOKERY                    | SC           |
| CONDYLURA CRISTATA       | STAR-NOSED MOLE            | SC           |
| COREOPSIS GLADIATA       | SOUTHEASTERN TICKSEED      | SC           |
| CORYNORHINUS RAFINESQUII | RAFINESQUE'S BIG-EARED BAT | SE           |
| DRYOPTERIS CARTHUSIANA   | SPINULOSE SHIELD FERN      | SC           |
| ECHINACEA LAEVIGATA      | SMOOTH CONEFLOWER          | FE/SE        |
| ELEOCHARIS ROBBINSII     | ROBBINS SPIKERUSH          | SC           |
| ELIMIA CATENARIA         | GRAVEL ELIMIA              | SC           |
| ETHEOSTOMA COLLIS        | CAROLINA DARTER            | SC           |
| FUNDULUS DIAPHANUS       | BANDED KILLIFISH           | SC           |
| HALIAEETUS LEUCOCEPHALUS | BALD EAGLE                 | FT/SE        |
| HETERODON SIMUS          | SOUTHERN HOGNOSE SNAKE     | SC           |
| HYLA ANDERSONII          | PINE BARRENS TREEFROG      | ST           |
| HYMENOCALLIS CORONARIA   | SHOALS SPIDER-LILY         | NC           |
| HYPERICUM ADPRESSUM      | CREEPING ST. JOHN'S-WORT   | RC           |
| HYPERICUM NITIDUM        | CAROLINA ST. JOHN'S-WORT   | SC           |
| ILEX AMELANCHIER         | SARVIS HOLLY               | SC           |

| SCIENTIFIC NAME             | COMMON NAME              | LEGAL STATUS |
|-----------------------------|--------------------------|--------------|
| IPOMOPSIS RUBRA             | RED STANDING-CYPRESS     | SC           |
| JUNCUS ABORTIVUS            | PINEBARREN RUSH          | SC           |
| LECHEA TORREYI              | PIEDMONT PINWEED         | SC           |
| LIATRIS MICROCEPHALA        | SMALL-HEAD GAYFEATHER    | SC           |
| LINDERA SUBCORIACEA         | BOG SPICEBUSH            | RC           |
| LOBELIA SP 1                | LOBELIA                  | SC           |
| LUDWIGIA SPATHULATA         | SPATULATE SEEDBOX        | SC           |
| LYCOPUS COKERI              | CAROLINA BUGLEWEED       | SC           |
| LYSIMACHIA ASPERULIFOLIA    | ROUGH-LEAVED LOOSESTRIFE | FE/SE        |
| MACBRIDEA CAROLINIANA       | CAROLINA BIRD-IN-A-NEST  | SC           |
| MAGNOLIA MACROPHYLLA        | BIGLEAF MAGNOLIA         | SC           |
| MAGNOLIA PYRAMIDATA         | PYRAMID MAGNOLIA         | RC           |
| MYRIOPHYLLUM LAXUM          | PIEDMONT WATER-MILFOIL   | RC           |
| NESTRONIA UMBELLULA         | NESTRONIA                | SC           |
| NOTROPIS CHILITICUS         | REDLIP SHINER            | SC           |
| OPHIOGLOSSUM VULGATUM       | ADDER'S-TONGUE           | SC           |
| OXYPOLIS CANBYI             | CANBY'S DROPWORT         | FE/SE        |
| PASPALUM BIFIDUM            | BEAD-GRASS               | SC           |
| PICOIDES BOREALIS           | RED-COCKADED WOODPECKER  | FE/SE        |
| PITYOPSIS PINIFOLIA         | PINE-LEAVED GOLDEN ASTER | SC           |
| PLAGIOCHILA SULLIVANTII     | LIVERWORT                | SC           |
| POTAMOGETON<br>CONFEROIDES  | ALGAE-LIKE PONDWEED      | SC           |
| PRUNUS ALABAMENSIS          | ALABAMA BLACK CHERRY     | SC           |
| PSILOTUM NUDUM              | WHISK FERN               | SC           |
| PTEROGLOSSASPIS ECRISTATA   | CRESTLESS PLUME ORCHID   | SC           |
| RHEXIA ARISTOSA             | AWNED MEADOWBEAUTY       | SC           |
| RHINICHTHYS ATRATULUS       | BLACKNOSE DACE           | SC           |
| RHODODENDRON EASTMANII      | MAY WHITE                | SC           |
| RHYNCHOSPORA INUNDATA       | DROWNED HORNEDRUSH       | SC           |
| RHYNCHOSPORA MACRA          | BEAK RUSH                | SC           |
| RHYNCHOSPORA OLIGANTHA      | FEW-FLOWERED BEAKED-RUSH | SC           |
| RHYNCHOSPORA PALLIDA        | PALE BEAKRUSH            | SC           |
| RHYNCHOSPORA<br>STENOPHYLLA | CHAPMAN BEAKRUSH         | SC           |
| SARRACENIA RUBRA            | SWEET PITCHER-PLANT      | SC           |
| SCIROPUS ETUBERCULATUS      | CANBY BULRUSH            | SC           |
| SCIURUS NIGER               | EASTERN FOX SQUIRREL     | SC           |
| SPILOGALE PUTORIUS          | EASTERN SPOTTED SKUNK    | SC           |

| SCIENTIFIC NAME                            | COMMON NAME              | LEGAL STATUS |
|--|--------------------------|--------------|
| STROPHITUS UNDULATUS                       | SQUAWFOOT                | SC           |
| SYLVILAGUS AQUATICUS                       | SWAMP RABBIT             | SC           |
| TOFIELDIA GLABRA                           | WHITE FALSE-ASPHODEL     | SC           |
| TREPOCARPUS AETHUSAE                       | AETHUSA-LIKE TREPOCARPUS | SC           |
| TRIDENS CHAPMANII                          | CHAPMAN'S REDTOP         | SC           |
| TYTO ALBA                                  | BARN-OWL                 | SC           |
| URSUS AMERICANUS                           | BLACK BEAR               | SC           |
| URTICA CHAMAEDRYOIDES                      | WEAK NETTLE              | SC           |
| VACCINIUM CRASSIFOLIUM SSP<br>SEMPERVIRENS | RAYNER'S BLUEBERRY       | NC           |
| VILLOSA DELUMBIS                           | EASTERN CREEKSHELL       | SC           |
| WAREA CUNEIFOLIA                           | NUTTALL WAREA            | SC           |

**STATUS** - legal status:

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**FE** - Federal Endangered  
**FT** - Federal Threatened  
**NC** - Of Concern, National (unofficial - plants only)  
**RC** - Of Concern, Regional (unofficial - plants only)  
**SE** - State Endangered (official state list - animals only)  
**ST** - State Threatened (official state list - animals only)  
**SC** - Of Concern, State Program.